Review of Literature
CHAPTER –II

REVIEW OF LITERATURE

This chapter presents brief review of studies conducted in the field of crop production, animal rearing as also mixed farming system prevailing in rural area of the country. The literature reviewed are presented as under–

Gangwar (1975)' The study was undertaken with following specific objectives (i) to examine the inter - district variation in the bovine population (ii) to examine the inter - district variation in the cost structure production and disposal of milk and (iii) to examine the applicability of the Burns hypothesis in the state i.e. the lower the rainfall the higher was the annual milk yield per cow the proportion of male cattle increased with rainfall while the proportion of the female buffaloes fell. For this study secondary data were collected from the statistical abstract of Haryana and family budgets of the cultivators in Haryana 1969-70. The study reveals that the cattle population was about 50 per cent of the total bovine population. There were inter - district variations in the cattle population (44 to 57 per cent) compared to the total bovine population. The population of the male cattle was found higher in the wet districts whereas the population of the buffaloes in milk was found higher. In the wet districts. Thus Burns hypothesis was found true with respect to the population. In the case of cattle the rate of mortality was less than the buffaloes. The proportion of cattle in milk was higher in the dry districts

and of buffaloes in wet districts. Since cattle consume less feeds and fodder than the buffaloes they are more adoptive to the dry region of the state. The cost of maintenance of a buffalo varied from Rs. 1256.18 in Hissar district to Rs. 557.89 in Ambala district. Similarly the cost of maintenance of a cow also varied from Rs. 840.46 in Hissar district to Rs. 328.70 in find district. The cost of cows and buffalo's milk was found to be Rs. 0.79 and 0.82 (excluding cost of labour) in 1969-70.

The cow's milk was mainly used for home consumption. In the case of buffalo the bulk of the milk was either churned for making ghee or consumed as fluid milk. Very little quantity of the milk was sold as fluid milk. Bum's hypothesis was not confirmed with respect to the milk yield of cow and rainfall.

Sohoni D.K. Deshpande S.L. and Joshi C.K. (1975). The main object of the establishment of milk scheme is to provide marketing outlets for the milk produced on the farm and to provide loans for the purchase of improved breeds of milch animal. The main purpose of this study was to assess the impact of milk scheme in Akola district A sample of 30 farmers was drawn from two primary milk co-operative societies in Akola district randomly for determining the average inputs e.g. fodder feeds concnet rates etc. per animal. The impact at the micro level is measured by taking the data published in the performance budget of the agricultural and co-operation department. The study relates to the period 1961 to 1971. The main findings of the study are:-

(i) The decline in the livestock population in Akola district during the year 1971 was due to a reduction of working buffalo population by 57.64 percent over 1961 due to drought in 1970-71. There seems to be no

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adverse effect of drought on the population of animals in milk.

(ii) The population of buffaloes in milk and cows in milk have increased by 4.57 percent and 0.96 percent in 1971 over 1961 respectively.

(iii) The animals in milk constituted 56 percent of the total milch animal in the case of buffaloes and 42 percent in the case of cows. The whole livestock herd is dominated by the number of cows which accounted for about 85 percent of the livestock population.

(iv) The ratio of population commanded per milch animal has declined from 1:11.42 to 1:14 in 1971.

(v) The availability of the resources like pulse chuni cotton seed cake and oil seed cake was found to be inadequate when compared with the schedules of feeds as recommended by the ICAR.

(vi) In spite of an increase in the production of milk from 245.38 lakh litres to 267.91 lakh litres in 1971 due to an increase in the productivity of milk per animal, the per capita per day consumption of milk declined from 56.52 grammes to 48.80 grammes due to higher rate of increase in population during 1971 over 1961

**Pichholiya K.R. (1975)**, The panchemahals district of Gujarat is rich in bovine population. Nearly 11 percent of the state’s bovine population is found in this district. The density of bovine population in the district per 59 km. was 123.47 according to the 1972 livestock census which is quite high as compared to the state average (50.64). Cattle forming is not a mere adjunct to agriculture but provides independent as well as supplementary sources of livelihood to a large, section of the district population. The natural factor endowment and proximity of milk market provides ample scope for

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the rapid development of cattle farming specially dairy in the district. The district’s bovine population during the period 1956-1972 census. Increased by 13.42 per cent as a whole. Between 1956 and 1972 census, all the censuses (expect the 1956 census) revealed an increase in the bovine population of the district. The total cattle had increased by 11.15 per cent and buffaloes by 20.30 percent in the district over a period of 16 years.

The average milk yield of the buffaloes and cows was poor and varied from one to two litres in the case of buffaloes and half to one litre in the case of cows. The estimated average milk yield per day in the district in 1972 was 266,000 litres of which the marketed surplus was about 64,000 litres. Out of 266,000 litres of milk, only 21,000 litres of milk were marketed through the organized milk societies. To start a model dairy plant the minimum requirement is 50,000 to 60,000 litres of milk per day throughout the year. Thus, the gap is large and the present production needs, to be increased to two fold for starting a dairy plant in the district. Though the natural factor endowments are favourable for dairy development in the district, no progress has been made in this direction due to the poor quality of indigenous breed and insufficient nutrition. In order to improve the bovine economy of the district following suggestions merit considerations (1) to prevent deterioration of the cattle and improving the breed, it is necessary to supply a large number of good bulls in the district. For this it is essential to establish as many bull centres as possible (2) As animal rearing practices in the area are far from satisfactory, cattle breeders of the district have to be educated in modern management practices of cattle breeding and grazing etc. (3) Any programme of cattle development will depend upon the availability of adequate feed and fodder. Therefore all steps should be taken to increase the feed and fodder availability. The district had a deficit of 46,428.38 tonnes of feed and fodder in 1972. Unless the feed and fodder availability is increased, the introduction of better breeds will not achieve significant results in improving
the bovine economy of the district.

Sharma K.N.S., Patel R.K. and Singh Surendra (1975)⁴. This study has made an attempt to project the bovine population, requirement and economic demand for milk in the country. By 1978 the end of fifth five year plan, the economic demand for milk was estimated at 38.68 million tonnes while based on a nutritional standard of 210 g. per capita per day, the requirement worked out to be 50.44 million tonnes. The present rate of increase in milk production is however quite slow. To meet this gap, the milk production should increase of the rate of 3 million tonnes per year up to 1976, 4 million tonnes up to 1979 and thereafter at the rate of 5 million tonnes. The projections for bovine population revealed only marginal increase in cattle population while buffalo population increased at a much faster rate especially in agriculturally advanced states like Punjab, Haryana and Gujarat. To meet the economic demand for milk, the country needs a population of 14 million additional indigenous cows to be brought under cross-breeding programme so as to get 6.3 million breedable cross-bred cows at the end of 1978-79. A successful milk enhancement programme will logically depend on integrated action plan involving genetic improvement, health cover, better nutrition and improved marketing facilities.

Gupta V.K. and Pandey R.K. (1975)⁵. During the past decade, there has been a substantial expansion of population and per capita income. Such an expansion may essentially, call for an expansion in (the demand for livestock products on the contrary, the supply of milk and milk products has been for from satisfactory. The future availability of milk may still be

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lower. For better planning of dairy development which may be consistent with resource endowments and requirements we need estimates of future consumption and supply of milk products. The per capita demand for milk has been estimated for future year using the relationship.

\[ Q_t = Q_0 \left( 1 + \frac{I_f - I_o}{I_o} \right)^e \]

where,
- \( Q_t \) = per capita demand in some future year (t)
- \( Q_0 \) = per capita consumption level in the base year
- \( I_f \) = per capita income in future year (f)
- \( I_o \) = per capita income in the base year
- \( e \) = income elasticity of demand for milk.

The total demand has been estimated from the above formula by multiplying it by the projected population for this future years. The demand for milk has been estimated at 25.84 million tonnes in 1979 and 31.61 million tonnes in 1986.

The supply of milk has also been estimated for future years using the linear relation \( y = a \cdot bT \) where \( y \) = annual production of milk in thousand metric tonnes and \( T \) = time period.

Using this formula, the estimates of the supply of milk have been obtained as 22.32 million tonnes in 1979 and 23.02 million tonnes in 1986. It is evident that there is a gap of 5 to 9 million tonnes of milk between the supply and demand for milk during the future years. This gap has to bridged for better and nutritious diet to be given to our people. An early attention must be given to reduce this gap. Steps should be taken to strengthen the annual milk production. Among other things the best way of increasing the production of milk is to maintain better management, proper breeding to suitable animals, managing the demand for milk and milk products and proper feeding of
livestock.

Raju V.T. (1975) This paper has made an attempt to discuss the problems of milk production and pricing of milk in India and solution for the problems. Before discussing these points, dairy development in India is reviewed. Dairy was almost a neglected field in India up to 1956. Dairy development got a Rip in 1970 when 'operation flood' was launched with the assistance from the world food programme. Though India is fourth highest milk producing country in the world, the yield per animal is very low compared to other leading milk producing countries. The per capita availability of milk in India is only 105 gm. Whereas according to the nutritional standards an adult person requires 284 gm of milk per day. This is due to an increase in the human population and at the same time cow production of milk. The reasons for the low level of production of milk in India are due to lack of intensive breeding facilities inadequate supply of feeds and fodders and facilities for disease prevention measures etc. To solve the problems of milk production it is suggested that the cross-breeding programmes and artificial insemination should be advocated. The fodder and feed resources should be improved and proper reserves of feed and fodder should be built against bad years. The milk producers should thoroughly be informed about the husbandry methods to enable the upgraded animals to fulfil their genetic potential in terms of milk production. They should also be provided with the infrastructure for veterinary care etc. that is needed for the support of the improved animals. Though the prices of milk and milk products are higher than other commodities, the milk producers are not getting remunerative prices for their product. The milk producers have practically no say in the pricing of milk. The determination of the pricing of milk has to be based not only on demand-supply equilibriicum but also on the compositional

quality of milk. A faulty pricing policy can lead to adulteration, production of one kind of milk, malpractices in payment for milk etc. A very large section of the dairy industry in India is paying for milk only on the basis of its fat contents. The inequities in fat differential pricing is discussed in detail. Fat differential pricing discourage the production of cow milk as milk is valued only on fat basis completely disregarding the SNF (Solids not fat) contents. One essential element in an equitable plan of paying a producer for his milk is that both fat and SNF be explicitly recognized and rewarded property. For this the “two-axis pricing policy” developed by the National Dairy Development Board, Anand is suggested and discussed. This plan recognizes both fat and SNF discourages adulteration and provides a common pricing approach to the cow and buffalo milk.

Kunwar R., Chauhan V.S. and Singh Ram Iqball (1975) The main objective of this study conducted during the year 1974-75 was to work out the economics of milk processing per litre under the public and co-operative units and to examine milk production, costs and income per milch buffalo per annum under the private and co-operative guided management. For the study one public and one co-operative unit where selected purposively while the selection of 30 private and 15 co-operative guided farmers was randomly done. The study revealed that the processing cost per litre in the case of public unit was about one and half times higher than the co-operative society. The processing cost per litre of milk. For private and co-operative unit was calculated at 36 and 24 paise respectively. The higher cost in the public unit was due to low quantity of milk handled during the year and secondly giving more emphasis to research and experiments and not to profit. The fixed cost and maintenance, cost per milch buffalo in respect
of co-operative and private farmers were calculated at Rs. 400 and Rs. 1,510 and Rs. 600 and Rs. 1,520 respectively. The gross income per milch animal per annum for co-operative farmers was Rs. 835 while in the case of private milk sellers it was Rs. 189 only. On the basis of this enquiry it is concluded that the co-operative society has superiority over the public unit as well as private farmers. Hence the development of such organization will be in the interest of producers consumers and the country as a whole.

**Garg, J.S. and Prasad, V. (1975)**. This paper has made an attempt to investigate into the problems faced by the co-operative milk Board, Kanpur, responsible for its poor achievements. The twin objectives of the milk Board were to enhance the milk yields of the adjoining villages of Kanpur city and other adjacent districts by giving incentives to the milk producers by purchasing their milk at a reasonable price and to distribute it to the consumers at kanpur after pasteurisation, at a very reasonable rate and in adequate quantity. The normal capacity of the kanpur milk processing plant is 50,000 litres per day against which only 12,500 litres of milk per day or 25 percent of the normal capacity is made available. The underutilization of milk processing plant, due to poor procurement of milk has led to higher cost of processing, sale and distribution of milk per litre. The total cost per 100 litres of standard milk borne by the milk Board in 1973 came to Rs. 79.98. It included procurement cost of Rs. 15.17 processing cost of Rs. 24.13, administrative cost of Rs. 24.60 and selling and distribution cost of Rs. 16.08 per 100 litres of milk. When the total cost per litre is worked out, it comes to 80 paise. The purchasing cost of standard milk per litre in 1973 was Rs. 1.40. Thus the total cost per litre of standard milk to the milk Board came to Rs. 2.20. This situation has emerged due to higher overhead cost of the milk Board. Which is neither advantageous to the

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So far as the problems faced by the milk Board in connection with its poor achievements are concerned they are manifold. In the case of the producers, they do not show response to part with their produce to the milk Board due to delay in payments. They prefer to sell their milk to the local milk hawkers who advance money to them and make a part payment for their milk supply frequently at the same or higher rate than the milk Board.

Further the local milk hawkers and local gwalas are in big competition with the milk Board. In the peak period of production, when there is larger supply and fixed demand the price of the milk should be reduced which is not possible for the Board to do so. The hawker also do the malpractice of mixing water to milk or take out cream and sell the milk to the consumer at the same rate while the milk Board can not adopt such malpractices. The consumers also feel that the quality of the milk supplied by the Board is not up to the mark. Their opinion is that the milk supply is neither certain nor punctual and is below standard. From the point of administration the establishment cost in the milk Board is extremely high. Mismanagement, mishandling, and over-expenditure are some of the important issues which lead to the inefficiency in the organization of milk Board. The cost of processing and distribution of milk is also very high which is due to poor procurement of milk and higher overhead costs.

Though the milk Board tries to make up the losses in the sale of milk by supplying toned and double toned milk and by supplying cream butter and ghee to the consumers, yet the whole concept of the Board needs to be modified. The payments to the producers should be made frequently. A part of the payment should be made in the form of concentrates for feeding their milch cattle. The producers should also be supplied with high yielding breeds of buffaloes and credit for purchase of milch cattle should be arranged. It was observed that only a small number of milk producers
(28 members per society) were taking the advantage of the milk Board programme. The programme should be extended to cover a large number of members service, 'punctuality, and certainty should be observed in the supply of milk to the consumers. The expenditure on the board of management and overhead costs should be reduced to the minimum.

Shukla, V.P. and Karanjiear, S.V. (1975) The purpose of the present study was to examine the working of jabalpur milk supply scheme and to inquire whether it has been able to fulfil its objectives specifically, an attempt was made to examine whether (i) the total volume of milk supplied to the scheme by the milk co-operatives affiliated to it had increased over the years (ii) the increase if any, was as a result of the increase in the number of milk suppliers and the extension of area from which milk was being collected (iii) the increase had come about through increase in the production and supply of milk by the individual members and (iv) the scheme had been successful in promoting dairy as a supplementary activity of its members in the rural areas. Since the processing and distribution of milk have less scope for effecting any economy once the investment in plant and other equipment is incurred, it is feasible to economise only by reducing the per unit cost of milk. Thus it is the efficiency in milk procurement which has to play an important role and as such the aspects of processing and distribution were not considered for the present. It appears that a large number of societies particularly those located relatively nearer to the scheme either ceased to function or showed a remarkable decline in milk supply to the scheme and that the scheme managed to maintain the overall increasing milk supply by opening newer centres in distant areas. A milk co-operative, namely, Mohania milk producer's society was selected keeping in view that it represented one of those societies that showed decline in milk supplies to the scheme

9 Shukia V.P. and Karanikar S.V. (1975) Economic Analysis of government milk supply scheme in Jabalpur Indian Journal of Agricultural Economics vol XXX No. 3 P.P.-144.
over the years and located nearer to the city of Jabalpur. It is intact located distance of 20 km. from the Jabalpur city and receives milk from surrounding 15 villages located within a radius of 20 km. from the society's milk collecting centre. During the process of selecting the farm household for survey, a careful examination of the data showed that the pattern of milk supplies by the milk suppliers varied greatly, not only over the years, but also seasonally. It is observed that more than 80 percent of the large size milk suppliers (more than 15 litres a day) were selling milk outside the society, while only small size milk producers continued to sell milk to the society. The results of the study suggest that a discriminatory price policy should enable the scheme to obtain larger milk supplies from its nearby milk shed area.

Krishna, P.V. and Bandyapadhyaya, S.C. (1975) since dairying is a profitable enterprise in recent years many dairies are coming up in the co-operative private and public sectors. In this paper an attempt was made to take up the case of Ahmedabad Municipal Dairy. The Government having failed in its attempts to start a milk supply scheme, had to request the municipal authorities to start a dairy and the request was readily accepted in the early stages this dairy used to get milk from Anand. Encouraged by the success a pilot project with 5,000 litres/day was started in 1957-58. This capacity was raised to 10,000 litres/day later. However in 1963, when the demand grew the municipal authorities in collaboration with UNICEF started a bigger plant. Through the present capacity is 1.20 lakh litres/day it is handing 1.65 lakh litres/day. The capacity is expected to be increased to 2.5 lakh litres/day in the near future. At present milk is supplied both by the federation (Sagar Sabar and Banas dairies) and nonfederation (Ahmedabad.Gopalak and Gandhinagar unions). The federation supplies a pasteurised milk whereas the non-federation supplies raw milk only.

and buffalo milk is collected in the dairy. The Ahmedabad municipal Dairy project stands fourth in India so far as handling of milk is concerned preceded by Delhi Calcutta and Bombay.

The total sale of milk has increased by 29 percent over a period of three years i.e. from 1971-72 to 1973-74. The share of higher fat toned milk has increased from 86 percent in 1971-72 to 97 percent in 1973-74. The share of whole milk and double toned milk has gone down from 8 percent and 6 percent to one and less than one percent respectively during the same period purchases of milk varied between the years as the dairy has got a good storage capacity. A major share of expenditure (more than 80 percent) was on raw materials followed by establishment and commission charges (7 percent). The expenditure pattern has not changed over the three years but the total expenditure has increased by nearly 42 percent over the period under study.

The per litre cost was Rs.0.35 in 1971-72 and 1972-73 but it increased to Rs.1.14 in 1973-74. The return however was Rs.0.40 per litre in 1971-72 Rs.0.41 in 1972-73 and it went up to Rs.1.09 in 1973-74. Thus the per litre expenses exceeded those of per litre returns due mainly to rise in the prices of raw materials and also expansion in sale. The selling price however has not increased significantly. Following suggestions can be made for the dairy to improve its working (i) considering the rising demand for milk in Ahmedabad city, the capacity of the diary should be doubled (ii) prices of the milk can be reduced if the milk could be made available at a cheaper-rate (iii) major decisions should be taken at the dairy itself (iv) supervision work needs strengthening lastly (v) some new schemes can be taken up by the dairy to include the huge number of milk producer in the city.

Chhikara O.P. and Gangwar A.C. (1975)\textsuperscript{11} The present study

\textsuperscript{11}Chhikara O.P. and Gangwar A.G. (1975) Resource productivity in milk production and Returns from cattle cross-bred cow and MURRAH Buffalo Indian Journal of Agricultural Economics vol XXX No.3 P.P.-146.
was undertaken to study the relative efficiency of the different types of milch animals. The specific objectives of the study were (i) to study the marginal value products (MVP) of the resources for different types of milch animals and (ii) to study the input-output details of different types of milch animals. The study was conducted in the interland area of Jind milch plant, from which four villages were randomly selected. From these villages 25 households were randomly selected. The data relating to the cross-bred cows were collected from the purposively selected villages and households survey method was used to collect the data information relates to the agricultural year 1974-75. To estimate the marginal value productivities of inputs and milk production function Cobb-Douglas production function was fitted.

The results of the study revealed that (1) the use of green fodder, dry fodder, concentrates and human labour explained about 45, 93 and 90 percent of the variation in the milk output of cow, Murrah buffalo and cross-breed cow respectively. The regression coefficients with respect to green fodder and concentrates in the case of cow milk, dry fodder and concentrates in the case of Murrah buffalo milk and green fodder in the case of cross-bred cow milk were found significant. (2) The marginal value productivities of green fodder, dry fodder, concentrates and human labour were found as 8, 23, 46 and 4 paise in the case of cow milk the M.V.P. of green fodder was negative for Murrah buffalo. The MVPs of feeds and fodder were highest in the case of cross-bred cow, compared to the cow and Murrah buffalo. (3) The total cost of milk production in a lactation was Rs. 1.795 Rs. 3.340 and Rs. 2.687 for the cow Murrah buffalo and cross-bred cow respectively. (4) The cost of feeds per litre of cow Murrah buffalo and cross-bred cow milk worked out to "Rs. 0.73 Rs. 1.13 Rs. 0.68 respectively. (5) The net return over the variable cost was highest for the cross-bred cow, followed by Murrah buffalo and cow. (6) The per litre cost of milk from cow, Murrah buffalo and cross-bred cow was Rs. 1.21 Rs. 1.52 and Rs. 0.96 respectively.
Table No. 1.3
THE ESTIMATED PRODUCTION FUNCTIONS OF BUFFALO AND CROSS-BREED COW CAN BE WRITTEN AS FOLLOWS:

<table>
<thead>
<tr>
<th>Type of animal</th>
<th>No. of observations</th>
<th>Regression coefficients</th>
<th>R^2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>X_1</td>
<td>X_2</td>
</tr>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Buffalo</td>
<td>25</td>
<td>-0.01478**</td>
<td>0.5278*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0016)</td>
<td>(0.2832)</td>
</tr>
<tr>
<td>Cow</td>
<td>10</td>
<td>-0.0158**</td>
<td>0.9975*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0027)</td>
<td>(0.2373)</td>
</tr>
</tbody>
</table>

Source in parentheses give the respective standard errors of the coefficients.

* Significant at 5 percent level.
** Significant at 1 percent level.
Singh B.B. (1975)\textsuperscript{12} The present study is concerned with the eastern region of Uttar Pradesh which is regarded as an agriculturally backward area with high pressure of population. The study sample consisted of 25 buffaloes spread over 15 farms and 10 cross-bread cows maintained on a farm. The reference period was 1973-74 and cost accounting method was followed for collection of data. To study the relationship of milk yield with different factors, Cobb-Douglas functions were fitted separately for buffaloes and cows. The comparative economics of buffalo and cross-bred cow shows that the latter is more profitable than the former. The magnitude of difference in the net profit amounted to Rs.800,00 per animal. The cross-breed cows were yielding more milk at lesser cost per unit. The average cost of production per litre of milk was calculated to Rs.1.55 and Rs.1.99 for the buffalo and cross-breed cow respectively.

The regression coefficients of the inputs except labour were significant. The regression coefficients in the functions denote elasticities of production for the respective inputs concerned and indicate the percentage change in milk yield associated with one per cent change in the quantity of corresponding input. The sum of elasticities of milk production in both the equations of buffalo and cross-breed cow are “1:28 and 1.60 respectively indicating increasing returns to scale. This implies that there are possibilities of increasing milk yield and returns through more use of input factors. The marginal value productivities of major inputs worked out on the basis of estimated production function, are higher, indicating the potentialities of higher return with increased quantity of inputs in the region.

Lavania, G.S., Shukla B.D. and Dixit R.S. (1975)\textsuperscript{13} the present

\textsuperscript{12} Singh B.B. (1975) Economics of production of milk Indian Journal of Agricultural Economic vol. XXX No. 3 P.P. -146.

study compares the economic aspects of milk production from cow and buffaloes in Kashi Vidyapeeth development block of Varanasi district in Uttar Pradesh. The study covers 60 farms having milch cattle spread over in five villages of the block. Of the total farms, 20 fall in the small size-group of below 1.50 hectares of operational area, 19 in the medium size-group with 1.50 to 3.00 hectares of operational land and 21 in the largest (Size-group having operational land above 3.00 hectares. In all, 227 milch cattle are maintained on the sample farms of which 146 are cows and 81 are buffaloes. The number of animals is maximum on the small farms (82) followed by the largest farms (79) and minimum (66) on the medium sized farms. The same trends were visible in the case of cows and buffaloes separately. The proportion of dry animals to the total milch animals is highest on the small farms and declines considerably on the larger farms explaining the inefficiency of small farms to those of larger farms.

On an average, costs on feeds per cow and buffalo are estimated at Rs. 741 and Rs. 1,244 per annum respectively witnessing an increasing trend with an increase in the size of farms. Of the total feed value, dry fodders accounted for about 45 per cent followed by green fodders and concentrates on all farms. The proportion of green fodder to the total feed value declined with an increase in the size of farms while a reverse and increasing trend is observed in the case of dry fodder and concentrates. The break-up maintenance cost of cows and buffaloes shows that the value of feeds alone accounted for 61 and 70 percent of the total maintenance cost in the respective category of animals. The gross maintenance cost per animal exhibited an increasing trend with an increase in the size of farms.

Milk production per day in the case of a cows and buffaloes showed a positive and increasing relationship with an increase in the size of farms. This supports the trends of maintenance cost. The production of milk per day is estimated at 2.65 and 1.92 litres per buffalo and cow respectively.
The corresponding estimates for the animals in lactation period are 3.25 and 3.02 litres respectively. The cost of production per litre of cow’s and buffalo’s milk is worked out at Rs. 1.47 and 1.54 respectively. It declined slightly from the smaller farms to the larger ones in the case of cows while no specific trend is observed for buffalo milk. The bulk line cost of production per litre of milk is estimated at Rs.1.38 and Rs.1.58 for cows and buffaloes when the production is taken at the bulk of 85 per cent. This cost covered nearly 80 per cent of animals and families.

The relationship between gross maintenance cost and milk yield per farm family has been studied with the help of correlation and regression analysis for all categories of farms. It is observed that the relationship is positive and significant at 1 per cent and 5 per cent level of significance on the medium and large farms explaining that the gross maintenance cost significantly affected the milk yield. It is not significant on small farms suggesting that the cost does not have significant impact on yield on these farms. Considering the comparative cost of maintenance, yield per milch animal and cost of production per unit of milk it can very safely be concluded that the cows are superior to buffaloes in the area of study.

Madalia V.K. and Charan A.S (1975) For modernization of rural India, development of dairying and livestock has been given considerable importance as a complimentary instrument of social and economic change. In Gujarat, dairy development on co-operative basis has made tremendous progress during recent years. This has enabled many farmers to supplement their financial resources. However, livestock raising is still regarded as a mixed and small-scale enterprise by most of the farmers. In the absence of large sized dairy enterprise, the livestock economy is studied mostly according to the size of land holding. This paper is an attempt in this direction.

The main conclusions of the study are as follows: The cost of maintenance of buffalo calf increased with an increase in the size of land holding, while for cow calf, excluding landless group, it showed a decreasing tendency. In the case of dry cows the cost of maintenance increased with an increase in the size of land holding, but for dry buffaloes it increased up to the medium sized farms only. Regarding the milking animals, the cost of maintenance was lowest for the land less group and highest for the medium sized farms. The major item of cost structure was feeds accounting for more than three fourths of the total cost. followed by labour. The cost of maintenance of animals in milk was invariably higher than that of dry stock on various sized farms. The cost of maintenance of various categories of buffalo was also more than that of various categories of cow. The cost of maintenance of animals in milk was largely associated with milk yield except for the medium sized farms. The net income per dry animal was highest in the case of medium sized farms, followed by landless group. Both these groups proved more efficient in producing one litre of milk.

Singh, R.I., Singh, G.N. and Singh, R.K. (1975) Keeping in view the important role played by the milch cattle in the farm economy of the state as well as the country, an attempt has been made in this paper to work out the economics of milk production on the farms in the rural areas of Aligarh district in Uttar Pradesh. The results are based on an intensive enquiry of 140 cultivators selected randomly grouped under six size classes, viz. 0.0-15, 1.5-3.0, 3.0-4.50, 4.50-6.0 and 6.0 hectares and above from five villages of Dhanipur block in Aligarh district. The study was conducted by survey I method covering the five year period 1966-67 to 1971-72. The study revealed that a net income of Rs. 105.12 per hectare was obtained from milk production on the sample farms which varied from Rs.84 on

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the largest size-group to Rs. 138.63 on the smallest one. The lower net income per hectare on the larger farms (4.5-6 hectares) was due to the fact that the farmers of larger holdings did not maintain sufficient number of milch cattle in proportion to the size of their farms. The overall input-output ratio came to 1:1.31 which varied from 1:1.22 on the smallest size-group to 1:1.35 on the size-group of 4.5-6 hectares. This increasing trend in the input-output ratio on the larger holdings was due to the fact that the farmers of this size-group maintained milch cattle of relatively good breed and fed them property. Crop and milk enterprises taken together yielded a net income of Rs.1,712.33 per hectare on the sample holdings which showed an increasing trend with an increase in the size of farm. The average values of input and output were worked at Rs. 1,789.81 and Rs.3,502.14 per hectare respectively. The average input-output ratio came to 1:2.03 which showed an increasing trend with an increase in the size of farm. The milk production contributed 11.56 per cent to the total output of the entire farm business as against 88.44 per cent contributed by crop production. The respective shares in the farm input of crop and milk production came to 81.51 per cent and 18.49 per cent.

It is found that the average yield of the cow and buffalo per lactation was 926.35 litres and 1,201.72 litres respectively. An average net income of Rs.267.98 per cow and Rs.389.11 per buffalo was obtained during a lactation. The average cost of production of milk per litre worked out to Rs.0.71 per litre for the cow and Rs.0.68 for the buffalo. The average input-output ratio was higher in the case of buffalo compared to the cow and it is estimated at 1:1.40 for the cow and 1:1.46 for the buffalo, which showed an increasing trend with an increase in the size of farms. The lower cost of production and higher input-output ratio on the larger farms were generally associated with higher yields per cow and buffalo, maintenance of relatively good breeds of buffaloes on these farms and better feeding
practices. The average cost of maintenance during a lactation period after deducting the income from dung, etc., came to Rs.703.81 per cow and Rs.860.08 per buffalo, the latter being higher than the former by 22.70 per cent. The net maintenance cost per cow and per buffalo varied from Rs.568.97 and Rs. 660 in the smallest size-group to Rs.690 and Rs.862.87 in the size-group of 4.5-6.0 hectares respectively. The increased net maintenance cost on the larger farms was due to the fact that the farmers in this size-group maintained relatively good breeds of cows and buffaloes and made higher investments on concentrates, green fodder, etc. In the case of both the cow and buffalo, fodder cost accounted for 46 and 43 per cent of the total maintenance cost respectively followed by concentrates (29 and 32 per cent), overhead charges (11.4 and 13 per cent) and labour charges (11 and 10 per cent).

The production function analysis was done to work out the marginal value productivities of different inputs used in milk production. The Cobb-Douglas type of production function was used for final analysis as it gave the best fit. The marginal value productivities of variable inputs were estimated by partial deviation of returns with respect to the input concerned at the geometric mean level of input. The highest marginal value productivity was worked out for concentrates being 3.47, followed by fodder (.326) and human labour (0.845) in milk production, indicating thereby that ways and means should be found to augment the use of production process of all the variables listed in it and specially in order of importance of concentrates, fodder and human labour.

Parthasarathy, I.V. (1975) The primary milk producers around Vijayawada do not realise adequate economic returns for their milk production

Parthasarathy, I.V. (1975), Economics of milk production and trade around Vijayawada Krishna district ANDHRA PRADESH Indian Journal of Agricultural Economics vol. XXX No.3, p.-149.
and trade. The study of the economics of milk production and trade covered one hundred dairy farmers supplying milk to the Integrated Milk Project (I.M.P.), Vijayawada, Krishna District. A. P. Their input-output ratios, involving 434 animals, grouped in eight herd sizes are worked out. The cost components are analysed. The trade in milk is described. The procurement and sale prices are compared, towards finding margins. The analysis revealed that the average input-output ratio was 1.31 per animal and the average yield 2.024 litres per lactation and the total cost of maintenance was Rs.3,112 and 85 per cent of it was on feeds. The cost of production of a litre of milk was Rs.1.48 and the net returns Rs. 1,038. The most economic size was 5 animals with site specific. Most of the milk trade was with private agencies and only a fourth with the I.M.P. The procurement price of Rs. 1.75 per litre and the sale price of Rs.2.10 per litre did not leave adequate margins. Measures towards improved margins should be extended towards pedigree breeding, scientific maintenance through balanced feed and supply of feed-mix and fodder at subsidised rates to enable the I.M.P. to procure the entire bulk of their milk production.

Garg, J.S. and Azad, M.P. (1975) The objectives of this study were; (1) to work out the cost of raising a cross-bred calf upto the age of calving and compare it with the calf of an existing breed (Sahiwal), (2) to analyse the cost and returns from a cross-bred cow, (3) to find out the problems associated with a cross-bred cow, restricting its acceptance by the farmers, in general and the small farmers in particular and (4) to suggest measures to overcome the problems. The data were collected from the records maintained by the Division of Animal Husbandry and Dairying of C.S. Azad University of Agriculture and Technology, Kanpur, for the period from December 27,1972- the date of birth of a cross-bred calf and Sahiwal - to date.

It is observed that a farmer invested a sum of Rs.1,898.65 upto the date of conception in raising a cross-bred calf which took 16 months to attain this age. As against it, the corresponding investment on a Sahiwal female calf on the same date came to Rs. 3,456.75 which took 31 months to attain this age. The maintenance cost of a cross-bred calf was just half of the Sahiwal female calf. The cost incurred on a cross-bred heifer during the gestation period came to Rs-1,410.45. Thus the total cost of a cross-bred cow upto the first calving worked out to Rs.3,253.10. If the cost incurred on cross-bred female heifer upto the date of first calving is taken to be the same for the Sahiwal female heifer as well, the total cost of a Sahiwal cow at the age of first calving would come to Rs. 4,819.19 which is higher by 33 per cent over that of the cross-bred cow.

As regards the cost and returns from a cross-bred cow per lactation, the study revealed that the net cost during lactation and dry period of 390 days was Rs.3,613.76. out of which the cost of feed and fodder accounted for 77.98 per cent. The cost of production per litre of milk came to Rs.1.01. The total production of milk in a lactation period came to 3,590 litres. If it is priced at Rs.2 per litre, the net profit per lactation of a cow would be Rs.3,566.24 in cross-bred cow. It is also concluded from the study that a cross-bred female calf born on December 27, 1972 is expected for second calving in March, 1976 after 38 months of the date of birth, while the Sahiwal female calf which was also bom on the same date, will come into first calving after 41 months of its date of birth. By this time, the cross-bred cow will be in the second calving. This is a distinct advantage of a cross-bred calf over a Sahiwal calf. An owner of a cross-bred cow will not only get the advantage of full quantity of milk of the first lactation amounting to Rs.3,566.24, but will also be benefited by having one more cross-bred animal, ready for conception, whose market value would be much higher than its cost of maintenance. In spite of the fact that the cross-bred cows
have distinct economic advantages it could not be accepted by the farmers in general and small farmers in particular for many reasons. These cattle cannot be easily maintained by the small farmers having limited resources and know-how. Green fodder and milk are the two most essential items of its feed, which are hardly available with the small farmers. In spite of these problems and difficulties, the cross-breeding programmes have a greater potential for increasing the availability of milk for the nation as a whole. In this context, following suggestions may be considered. The whole cross-breeding programme should be taken up in three stages. In the first stage, the cross-breeding programme should be confined only to those indigenous cows which have 1,500-2,000 litres of milk capacity per lactation with the size of exotic breed having milk index of 6,000-8,000 litres. In the first generation of the cross-breed, the approximate yield of the progeny would be around 4,750 litres per lactation having 50 per cent of the foreign blood. The cross-bred sires of the first generation whose number would be about 50,000, should be allowed to cross the indigenous cow of medium productivity in the intensive cattle development areas. The progeny of this cross-bred is expected to yield about 2,700 litres of milk per lactation with 25 per cent of foreign blood. In the third stage, the sires of the second generation numbering 25 lakhs should be allowed to cross the non-descript desi cows whose number at present is 3 crores. Their progeny cows will have at least 1,350 litres of milk production per lactation with 12.5 per cent of foreign blood, whereas their mothers so far were producing hardly 200-500 litres of milk per lactation. The whole process would take about 10-12 years within which about 5 crores of cows will become cross-bred. It will not only increase the income and productivity of an individual farmer, but will also add to the availability of milk to the nation as a whole.

Srivastava, H.L and Singh, G.N. (1975) Observing the important

role played by the milch cattle in the economy of the farming community, an attempt is made in the present study to work out the cost of maintenance of cow and buffalo separately per inter-calving period and to find out the input-output relationship in milk production. The findings are based on an intensive enquiry of 30 farmers, having milch cattle, selected purposively from five villages of Kalyanpur block, district Kanpur, Uttar Pradesh. The findings of the study revealed that the average net maintenance cost for the cow was Rs. 1,079.46 as against Rs. 1,351.41 per inter-calving for the buffalo. The inter-calving period for the cow and buffalo came to 404 and 437 days respectively. The total milk production per lactation for the cow was 740 litres as against 388 litres for the buffalo. Although, the lactation days of the buffalo is higher by only 24 days compared to that of the cow, the buffalo produced 248 litres of milk more than the cow. The milk yield for the cow and buffalo, on an average, came to 2.89 and 3.53 litres per day respectively. The cost of production of milk for the cow worked out at Rs. 1.64 as against Rs. 1.37 per litre for the buffalo. An interesting picture that emerged from the study was that although the net maintenance cost was higher in the case of the buffalo the cost of production per litre of the buffalo milk was lower than that of the cow milk because of relatively higher milk yield produced by the buffalo.

The input, output and net income per cow came to Rs. 1,079.46, Rs. 1,295 and Rs. 215.54 per inter-calving respectively. The respective values for the buffalo came to Rs. 1,351.44, Rs. 1,729.00 and Rs. 377.56. An additional expenditure of Rs. 271.98 on the maintenance of buffalo resulted in an additional output of Rs. 434 and net income of Rs. 162.02 per inter-calving, compared to that of the cow. The average input-output ratio came to 1:1.20 and 1:1.28 for the cow’s and buffalo’s milk, respectively. The low productivity and earnings from the milch cattle in the study area was due to the poor breed of the animal, inadequate feeding and poor management. Therefore, to raise
the level of productivity and income per milch cattle, proper breeding, feeding and management is essential.

Kuber, Ram and Kulwant, Singh (1975) The Indian dairy industry is characterized by low productivity of cattle, high cost of milk production and low margin of profit. Cross-bred cows are an effective measure for increasing milk production and reducing the cost. To compare the economics of cross-bred (Karan Swiss) and best pure bred (Red Sindhi, Tharparkar, Sahiwal) zebu cows, a study was conducted at the National Dairy Research Institute, Karnal for the year 1973-74. The study revealed that the cross-bred calved early (831 days) compared to the pure bred (1,077 days). The cost of calf rearing was lower in the cross-bred (Rs.2,435) than in the pure bred (Rs.3132). Feed cost was observed to be the most important component accounting for about 76 per cent of the total cost. The component of the feed cost were 21 percent milk, 51 percent fodder and 28 percent concentrate including 3 percent calf starter. Any attempt to reduce the cost of nutrients will bring down the cost of calf rearing. The lactation length, dry period and the inter-calving period were lower in the cross-bred and the milk production was much higher. The average yield in the cross-bred was 9.83 litres compared to 5.92 litres in the pure bred. The cost of milk production was 95 paise per litre in the cross-bred compared to 148 paise in the pure bred. Feed cost was the most important component followed by labour and replacement cost. Replacement cost in the cross-breds was just 50 per cent of the replacement cost in the pure bred. In the case of pure bred cows the per litre cost of milk production tended to increase after the third lactation, while in the cross-breds, the per litre cost continued to fall even up to the seventh lactation. The study further revealed that the per litre cost decreased.

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with the increase in the level of production. About 50 per cent of the pure bred cows were producing less than 2,000 litres of milk in a lactation while only 10 per cent produced more than 3,201 litres. In the case of cross-bred 50 per cent of the cows yielded more than 3,600 litres of milk. The study pointed out that both the bred and cross- bred cows yielding less than 2,400 litres of milk in a lactation were unprofitable. The overall profit per day in a cross-bred cow was Rs.5.29, while it was Rs.0.19 in the pure bred. The optimal level at which the per litre cost was minimum was found to be 13.07 litres in the cross-breds and 8.40 litres in the pure breds. The high proportion of fixed cost in the maintenance of cattle was also observed. All these results of the research demonstrate the economic superiority of the cross-bred over the best pure bred Zebu cattle.

Kuwar, P.N. (1975) The twin objectives of a sharp and quick increase in milk production and mitigating the rural poverty through the implementation of a programme of cross- bred cows are generally conceded. However, to formulate a viable programme of cross-bred cows, it is necessary to have data on the economics of cross-bred cows. In the past one decade, the National Dairy Research Institute, (NDRI), Karnal, is the only institute at the national level which has undertaken the cost studies of milk production. Unfortunately, no fuller data on costs of milk production are available. Most of the cost studies suffer from certain serious flaws. A number of cost studies confine themselves to the variable costs and hence capital costs are ignored. What is more, these studies relate to one or two specific years and hence do not cover the entire life cycle of the milch animal. The cost of milk production varies from lactation to lactation. A study conducted in 1970 at the Bangalore Station of the NDRI showed that the cross-bred cows gave better performance in the second lactation. It was concluded

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20 Kuwar, P.N. (1975) Economics of cross-bred cows Indian Journal of Agricultural Economics vol. XXX No. 3 P.P.-151-152.
that cross-bred cows can be maintained at the farm up to the eighth lactation. The average cost of milk production per line in respect of the cross-bred cow was Rs.0.72 as compared to between Rs.1.11 and Rs.1.24 in the case of pure breeds of Indian cows. It may be interesting to know that the feed cost of the cross-bred cow alone accounted for 55 per cent of the total cost. Nevertheless, the cost of milk per litre is the cheapest in respect of the cross-bred cow as compared to the pure breeds of the interim Indian cows and buffaloes. The national commission on agriculture in its Report has thrown up some comparative data on the economics of milk production in respect of a buffalo, cross-bred cow and indigenous cow. According to the findings of the Report, the total cost of milk production in the case of cross-bred cow was Rs.0.44 per litre (exclusive of labour cost) as compared to Re.1.04 and Re.0.62 per litre in respect of a buffalo and indigenous cow respectively. A study entitled “Intensified Cropping and Milk Production” which was conducted in Ludhiana by the Punjab Agricultural University in collaboration with the Food Foundation and others revealed that dairying is more paying than general cropping of bullock operated as well as mechanized farm. The study showed that the milk production is comparatively much paying with cross-bred than the buffaloes. Most of the cost studies on the economics of milk production are conducted in a rather unscientific manner. So no valid inferences can be drawn. It is, therefore, suggested that the Department of Agriculture of the Ministry of Agriculture and Irrigation should prepare a proper proforma for the scientific collection of cost data on milk production. For this purpose, the authorities should also issue detailed guidelines to the Research Stations of the National Dairy Research Institute.

Waghmare, R.E. and Diskalkar, P.D. (1975) The Government of Maharashtra have started milk schemes, at 22 centres in the state, wherein

21 Waghmare, R.E. and Diskalkar, P.D. (1975) Economics of milk production in konkan Region of Maharashtra Indian Journal of Agricultural Economics vol. XXX No. 3 P.P.-152.
the milk is procured from the farmers. Out of these 22 centres, one centre, viz., Mahad situated in Konkan region of Maharashtra was selected for studying the economics of milk production. Mahad tahsil is an under developed area. A sample of 5 villages out of 36 villages covered in the milk scheme was selected randomly. From each of the villages a sample of 12 milk producers was further selected. Thus the total sample consisted of 60 farmers. The data were collected by survey method and refer to the period 1970-71.

Farming is the main occupation of the sample farmers while milk production is a subsidiary occupation. The total sample of cultivators was further categorized into three size groups, viz., very small, small and medium, having their holdings below 0.81, 0.82 to 1.62 and 1.62 to 3.54 hectares respectively. The number of farmers analysed under the three size groups was 11, 25 and 20 respectively. The cows were of local breed while in the case of buffaloes, 46 were of Mehsana breed and the remaining 72 were of local breed. The average cost of maintaining a buffalo was observed to be Rs.592.67 per annum. The highest cost (Rs.1,718.51) was observed in the case of very small farmers. On examining the itemwise cost of maintaining the buffalo, it is observed that on an average, concentrates accounted for 31.95 per cent of the total cost, followed by family labour (27.42 per cent), and depreciation and interest on fixed capital which together accounted for 21.64 per cent. The average income per year from a buffalo was Rs.465.30. On the basis of cost ‘C’, there was a loss of Rs.124.37. However, at cost ‘A’ one buffalo gave a profit of Rs.109.37. The per litre cost of production of milk at cost ‘A’ basis was Re.0.74 while at cost ‘C’ basis it was Rs.1.25. The price received by the farmers was Rs.1.00 per litre.

The cultivators under study had also maintained 54 cows. The average number of cows maintained by them was (0.90) nearly 1.00. On an average, the total cost of (cost ‘C’) maintaining a cow per year amounted to Rs.255.36 and at cost ‘A’ basis it amounted to Rs.47.92. The milk yield from a cow
was 135.19 litres during a year. The litre cost of production of cow milk on cost ‘A’ and ‘C’ basis was Rs.0.77 and 1.75 respectively. On an average, the per farm annual expenditure on milk production on cost ‘A’ and ‘C’ basis was Rs.867.62 and Rs.1,484.52 and the annual income from the milch animals was Rs. 1,131.47 thus yielding a profit of Rs.263.85 respectively and (−) Rs.353.05 respectively at cost ‘A’ and cost ‘C’ basis respectively.

Parkale D.G., Kasar D.V. and Pise D.R. (1975) An attempt has been made in this paper to examine the costs and returns structure and thereby the profitability of the newly established dairy project at the Mahama Phule Krishi Vidyapeeth, Rahuri by way of a case study. All the milch animals formed the population of the study and information was obtained from the records maintained by the dairy farm for a period of three years, i.e., from April 1971 to March 1974. The average number of milch cows ranged from 84.5 to 123.7 during the period of study. The dairy herd is of Gir breed. The study showed that the share of working cost and fixed cost in the total cost at the overall level worked out to 73.38 per cent and 26.62 per cent respectively. Of the total cost, feed cost accounted for the largest share, followed by herd replacement cost, labour cost and interest on the value of dairy farm structures. Among different feeds, the cost of green fodder was the highest followed by the cost of ration and concentrates, and dry fodder. It is observed that the annual gross income per cow on the dairy farm amounted to Rs.2,238.04, of which 74.65 percent was derived from milk 12.93 per cent from manure and 12.42 per cent from calf-rearing and sale of surplus animals. The annual average total cost and net income per cow worked out to Rs.1,961.90 and Rs.276.14 respectively. The study also revealed that the per litre net cost and net income of milk

production on the dairy farm during the period of investigation was Rs.1,53 and Re.0.30 respectively.

Singh R.B. and Krishna P.V. (1975) An attempt is made in this paper to study the comparative economics of three private dairies in Meerut (Uttar Pradesh) based on analysis of data for one month. The number of milch animals maintained in the three dairies was 12.20 and 25 respectively. The quantity of milk produced and sold locally in each of them was 2,860 litres, 5,550 litres and 7,290 litres respectively and the sale price of milk was Rs.2.25 per litre. The cost of maintenance of milch animals including fodder and concentrates in the three dairies amounted to Rs.3,600, Rs.6,000 and Rs 7 500 respectively. Other expenses such as servant's pay, rent water charges electricity, veterinary charges, etc., amounted to Rs.405, Rs.763 and Rs.1 1.155 in the three dairies respectively. The total returns from the sale of milk and milk products amounted to Rs.6,585, Rs.12,487 and Rs.16.502 and the net returns worked out to Rs.2.580, Rs.5,724 and Rs.7,847 in the three dairies respectively. The net returns per litre of milk produced came to Re.0.90 in the first Rs.1.03 in the second and Rs.1.08 in the third dairy. The conclusions of this study are that the maintenance cost of milch animals formed the major item of expenditure in all the dairies accounting for 87 to 90 per cent and the remaining expenses formed only 10 to 13 per cent of the total expenditure. The net returns per litre of milk produced showed in increase with an increase in the number of milch animals in the dairies. More and more dairies can be opened particularly in the co-operative or public sectors to enable the producers to benefit more.

Pal, R.N., Faroda, A.S., Sastry, N.S.R. and Yadav, R.S.(1975) An attempt is made in this paper to study the economics of milk production

under specialised dairy farming with eight Murrah buffaloes at the Haryana Agricultural University, Hissar during 1972-73 to 1974-75. The buffaloes were in the second and third lactation. The results of the study pointed out that more than eight buffaloes (about ten) and their followers can be maintained on two hectares of land having cropping intensity of about 260 per cent and with assured irrigation. If green and condition on the fodder is made available ad lib., the animals can be maintained in condition on the fodder alone at the present level of milk production, i.e., upto about 1,500 litres per annum per animal. Such scheduling will result in low cost of milk production which on the average comes to Rs.1.24 per litre. The cost of milk production can be reduced to as low as Rs.1.04 per litre if the milk yield per animal is better. The net return from specialised dairy arming are in certain years better than that from mixed and arable farming. The returns will be still more if cross-bred cows are kept as dairy animals instead of buffaloes because the cross-bred cows are heavy yielders than the buffaloes. Even if the returns are equal from different types of farming, dairy farming will be better particularly for the small farmers because it will provide employment throughout the year, there will be regular cash income and the soil fertility will be improved with the addition of excrete. Dairy farming will be more advantageous particularly near the cities where ready market for milk is available.

Sharma, K.N.S., Agarwal, S.B. and Patel, R.K. (1975) This study has made an attempt to estimate the milk production and its utilization among different categories of milk producers. The data for the investigation were obtained from the survey conducted to study the bovine development and milk production around Karnal during 1972-74. In all 1,807 milk producers were included in the sample. Of these, 825 were landless labourers, 63 marginal

farmers, 254 small farmers, 5700 medium and 95 were large farmers. It was observed that Murrah buffaloes and Haryana cows were the two major milch breeds accounting for more than 95 per cent of the milch animals. About 63 per cent of the milk producers belonged to the category of small and marginal farmers and landless producers. These categories of producers owned 59 per cent of the total cows and 41 per cent of the total milch buffaloes. Fifty per cent of the cows and 56 per cent of the buffaloes were in milk. Though no definite trend was observed, the number of animals in milk was slightly higher among the marginal and small farmers and landless labourers. The average milk yield per cow per day was 2.41 kg. and that of buffalo was 3.96 kg when in milk. The overall average milk yield per animal per day was 1.20 kg. for the cow and 2.20 kg. for the buffalo. The milk yield in general increased with an increase in the land holding. The per capita consumption also increased with the farm size. Thirty per cent of the milk produced was consumed as fluid milk. 43 per cent in the form of products and the rest 27 per cent was available for sale. The marginal and small farmers and landless labourers contributed 41 per cent of the total quantity of milk sold. The buffaloes were observed to be more efficient converters of fodders and feeds into milk than the cows. 18-20 per cent of the cropped area was observed to devoted for fodder crops. Jowar, maize and guar were the principal crops in the kharif season and berseem was the only major cropk in the rabi season. It was obser that any programme to develop dairy farming to increase the milk production in the area should give due emphasis on the marginal and small farmers and the landless producers.

Bahadure, et.al. (1981), In a study the milk production, consumption and marketed surplus in different categories of households and in various seasons in two villages in Karnal are examined, and the various factors affecting the marketed surplus of milk in different categories of households studied, using tabular and multiple regression analysis. Data refer to the
Investment per milch animal was higher in the small farm categories than for medium farmers, since the latter owned a large number of local cows whose market value was lower than that of the buffaloes and crossbred cows. Milk production, consumption and disposal per household in rainy and winter season were almost identical. Milk production was lowest in the summer season, but, as a percentage of production, marketed surplus in this season was the highest (66%). 82 to 96% of the total variation in the marketed surplus in the different household categories was explained by the included variables, the most significant variable being milk production per day.

Gill, et.al. (1983), The state of punjab was divided into 4 homogeneous zones based on the milk-crop-climate complex, and 4 villages and 40 farm holdings from each zone were selected for study. Dairy herd size (buffaloes, local cows and crossbred cows) and milk production / farm were positively correlated with farm area but the number of dairy animals/unit of cultivated area declined sharply as farm area increased. The marketed milk surplus was greater on small than on medium and large farms, and ranged from 11.05 to 31.17%.

Gupta and Patel (1988). A observation involving households of 75 landless labourers (LL), and 67 small (SF), 33 lower medium (LM), 30 upper medium (UM) and 12 large (LF) farmers in 6 villages in Karnal, India, overall marketed surplus (MS) of milk was 43.45, 49.57 and 51.77% in summer, rainy and winter seasons respectively, and accounted for 50.69, 48.34, 47.36, 49.21 and 45.60% of milk produced by LL, SF, LM, UM and LF respectively (overall mean 48.67%). Level of milk production was the single most important factor that affected MS, and had a significant effect in all groups and all seasons. Family size significantly affected MS in all groups except LF in summer and affected SF in the rainy season, whilst income affected MS only in the LL group in summer. A 'dummy
'variable' (preference for selling to an organized dairy) had a significant negative effect on MS in the LL group in summer and LM group in rainy and winter seasons and a positive effect on UM group in summer. Distress sale of milk was observed occasionally, mainly amongst the LL group where sales of 16, 24 and 32% of milk produced by 3, 7 and 4 LL were noted in summer, rainy and winter seasons respectively. The reluctance of farmers to sell their milk to organized agencies shows a need for these establishments to improve their terms and conditions of milk purchase.

**Bal, et.al. (1989).** The paper presents a report on the economics of milk production and the marketing of milk in three agro-climatic zones of the Indian Punjab. Milk production on an average farm holding in the state was 4577 ml in 1982-83. Nearly 40% of the total milk production was sold in the market at an average price of Rs. 2.35/l, while the cost of production was Rs. 2.08/l. Per capita consumption of milk on Punjab farms amounted to 850 ml per day, higher than the national level of 120 ml but much less than the minimum nutritional requirement of 210 ml per day. Intermediary agencies appropriated 30% - 40% of the consumer price depending upon the number of agencies involved. The study shows a large surplus of milk on farm holdings in Punjab state which could be extracted by improving the existing marketing system and providing remunerative prices to milk producers received through the sale of milk and manure, with special reference to Patna district, Bihar, India. The study was conducted on households benefiting from an Indian dairy development scheme providing financial assistance to small farmers and agricultural labourers and other households who were not on the scheme.

**Ahir and Singh (1994).** In South Gujarat, a heavy rainfall agro climatic zone in India. The business of milk production in a supplementary enterprise to crop farming. Therefore, dairy decisions are interrelated with cropping decisions. The average farmer kept 2.56 dairy animals of which buffaloes
were predominant. There was a low investment in dairy farming and the milk yield of all classes of lactating animals was low. Private traders and organized milk collection facilities co-exist in the area and many farmers preferred to sell milk, particularly buffalo milk, through the farmer agency.

**Kaur et al. (1994).** The study has been made to 50 randomly selected milk producers, including small, medium and large producers (0-10, 10-20 and <more than>20 litres milk/day respectively), from villages situated 5-10, 10-20 and <more than>20 km from a city or town in the Indian Punjab. The small, medium and large producers respectively produced on average 8.80, 16.43 and 31.50 litres milk/day, of which 5.70 (64.7%), 11.75% (71.5%) and 24.88 (79.0%) was marketed surplus of this marketed surplus, 55.8, 46.0 and 34.4% was sold to milk vendors, 21.1, 43.7 and 57.0% to the organized sector (Milkfed), 20.4, 2.1 and 0% to consumers, and 2.8, 8.2 and 8.0% to Halwais. In each of the three categories of milk producer, the marketed surplus was directly related (P<less than >0.01) to daily milk production and inversely related (P<less than>0.01) to consumption of milk by the family, but although marketed surplus was affected by the price of milk and size of family these influences were not statistically significant. It is suggested that there is potential for increasing the marketed surplus of milk by increasing the price of milk.

**Singh and Singh (1994).** The collected data on production, consumption and marketed surplus of milk on an average farm in urban and rural areas of Ludhiana (India) for 1985-86, the disposal pattern of milk, and the costs and margins of different agencies in marketing milk in these areas, are analysed. The analysis showed that there is a vast potential for development in the dairy sector, which now contributes 20% to gross farm income in the Punjab, and that integration of dairying with crop production could increase income and employment. Analysis of figures for the maintenance cost of milch animals and the economics of milk production in three areas of the Punjab
for 1989-90 showed that, for small, medium and large farms respectively, the overall cost (in Rs/liter) was 3.12, 2.91 and 2.67 for milk.

**Anonymous (2000).** Based on material from the Bulletin of the International Dairy Federation (1990) No. 339, a detailed description of the situation in the world dairy industry is given. Areas covered include milk production (divided into cow, buffalo, and ewe, goat and other species): industrial processing of milk the use of milk (drinking milk and whole milk products, butter and other types of milk fat products, cheese, preserved milk, and products from whey, casein and other dairy ingredients): trade in milk products: milk and mill product supply: milk product prices on national markets: and concentration of processing operations within the dairy industry 21 statistical tables and 1 graph are included in the text.

**Tyburcy (2000).** The study conducted to the standard and real costs, and profitability of milk production were determined in five groups of farms. These were farms involved in the Polish-Norwegian Programme for Milk Quality Improvement, the Polish-Canadian Dairy Programme, the Polish-Dutch Project for Development of Private Dairy Farms, and two groups of traditional farms specializing in milk production and located in Mazovia, Malopolska and Pogorze regions. No significant differences in real costs (Per 1 litre of milk) were observed between groups. Farms producing more milk and selling it for higher prices achieved the highest agricultural income.

**Sidhu, R.S. and Bhullar, A.S. (2004)** Conclusively noted that livestock economy especially dairy is considered to be an economically viable alternative for increasing income and employment in the farm sector of Punjab. It is clear that the contribution of livestock economy to the farm sector has increased over time whereas the contribution of crop sub-sector to the agricultural growth as well as NSDP has declined due to stagnation/fall in productivity of important crops, rise in fixed cost and degradation of soil and water resources. The importance of dairy especially on small and marginal
farms has increased and the proportion of dairy to the total farm business income on these farms has increased. The economic sustenance of these farmers is primarily dependent on dairy enterprise as it helps in utilising their surplus family labour, requires less land and water resources and provides cash income to meet their daily consumption needs. The dairy sector has also helped in generating employment on small, marginal and semi-medium farms despite fall in employment in crop production. However, the decrease in labour demand for crops on medium and large farms was so large that even the increase in employment due to growth of dairy enterprise failed to offset it. The increase in per capita income, rise in milk prices and expansion of milk processing and milk collection facility were responsible for the growth of dairy enterprise in the state.

Despite significant improvement in the milk production and contribution of livestock to the net state domestic product over time, there are some aspects, which are impeding its fast growth and leading to lower economic efficiency than the potential. Most important is the composition of livestock animals, which includes a large chunk of unproductive and low milk yielding animals. According to 1997 livestock census, out of 5,010 thousand dairy female animals, 34.4 per cent were either dry or have not calved. Though this proportion was little lower than the percentage of unproductive animals in the year 1990, which stood at 36.62 per cent yet in absolute terms, their number increased from 1,610 thousand to 1,726 thousand, respectively, during this period. Secondly, the proportion of buffaloes, which are normally low milk yielding, in the milking animals is still very high as 74.8 per cent in 1997. In spite of the fact that buffalo is a preferred animal for milk over cow in Punjab, the proportion of high-yielding cross bred cows has improved from 15.82 per cent in 1990 to 19.21 per cent in 1997, but this increase has come at the cost of local cows and the importance of buffalo has not diminished. The susceptibility of cross bred cows to diseases and hot and humid conditions
of the state have also restricted their expansion. The issue of increasing the number of unproductive animals is associated with the non-availability of any facility for slaughtering these animals in the state.

Low milk yield is another important factor responsible for slower growth of dairy than the potential. The average wet yield of milk per lactation of 305 days in a year was estimated as 1,491 kg in 1990 and went up to 1,718 kg per lactating animal in 1997, which is still far below the potential that can be achieved by maintaining high-yielding buffaloes and cross-bred cows, balanced feeding and scientific animal housing and sanitation facilities. According to the experts of the Department of Animal Sciences in Punjab Agricultural University, the Murrah breed of buffalo has the average potential to yield upto 4,000 litres of milk per lactation where as the present average yield is about 1,700 litres/ lactation and the Holstein-Friesian cross bred cow can yield upto 7,000 litres of milk/lactation whereas the present average yield is about 3,000-3,200 litres/lactation. Therefore, the realised potential is only 42.5 per cent in case of buffalo and 45.7 per cent in case of cross-bred cows due to poor quality of animals (mixed breeds), inbreeding of the animals, low quality and inadequate feeding, poor housing and sanitation conditions and hot and humid climate during summer.

The availability of green fodder to the animals has fallen due to significant rise in the number of cattle while there was no increase in the area under green fodder crops. The total number of animals above 1 year of age increased from 5,274 thousands in 1990 to 5,495 thousands in 1997 and the number of milking animals from 2,787 thousands to 3,285 thousands, the area under fodder in Kharif and rabi seasons put together was estimated as 802 thousand ha in 1990-91 and 801 thousand ha in 1997-98. Consequently, the number of animals fed per ha of green fodder has increased from 6.58 animals to 6.86 animals respectively. If we consider only milking animals, the number of such animals fed per ha rose from 3.48 to 4.10 respectively. The animal
nutritionists at Punjab Agricultural University argue that the present availability of green fodder at 17kg/animal is grossly inadequate as compared with the requirement of 40kg/animal resulting into poor health and low milk yield. Secondly, the animal feed is prepared from low quality grains. It has also been witnessed that the animal sheds lack proper ventilation, levelled flooring and other sanitation conditions affecting milk production adversely. All these factors result in lower economic efficiency of dairy sector in Punjab and impede its growth from attaining the potential it possesses. These issues need to be addressed if we intend to put the dairy sector on fast growth path so that it can generate income and employment to a higher degree, ameliorate deteriorating economic conditions of Punjab farmers and check depleting land and water resources of the state by offering as a strong alternative for diversification to rice-wheat system.

**Contribution of Dairy and Crop Enterprises to the Economy of the Rural Families in Semi-arid Region of Rajasthan:**

Sharma, B.L. and Sharma, R.C. (2004) carried out a study to estimate the contribution of dairy and crop enterprises towards income and employment in relation to different size of holdings in the semi-arid region of Rajasthan. For this study data were collected from 60 farmers in the four adopted villages of Sikar tehsil of Sikar district during the agricultural year 2003-04. The Agricultural Research Station, Fatehpur-Shekhawati, adopted these villages since 2001. The farmers were classified into different size groups, namely, small (upto 2 ha), medium (2 to 4 ha) and large (4 ha and above). From each village and each size group, 5 cultivators were randomly selected. The results indicated that per hectare cost of cultivation on the sample farms worked out to Rs. 52,640 and net income was Rs. 18,669 per hectare. The costs and returns from crop production activities increased as the size of the farm increased. Farm business and family labour income per farm were Rs. 47,198 and Rs. 32,440, respectively. The farm business and
family labour income increased with increase in the size of holding. The per farm total maintenance cost incurred in cow, buffalo and goat was Rs. 16,836, Rs. 25,570 and Rs. 4,212, respectively. In case of buffalo, the maintenance cost per farm increased with increase in farm size. The per farm net income received from dairy enterprise was Rs. 10,155. Percentage net return over total cost was 21.78 per cent, which decreased with increase in the size of farm. Farm business and family labour incomes from dairy farming were Rs. 27,669 and Rs. 27,059 respectively. The crop farming contribution was 64.81 per cent and dairy farming contributed 35.19 per cent to the total income. In dairy farming, percentage share of total income decreased with increase in the size of farm while reverse trend was observed in crop enterprise. Dairy enterprise provided maximum employment of 338 man-days and crop farming provided 219 man-days. Per worker employment from crop and dairy farming were 80 man-days and 123 man-days, respectively. Thus, dairy farming plays a key role in increasing employment and income in the semi-arid tract of Rajasthan.

Chand, Khem and Gajja, B.L. (2004) made an attempt in the present paper to analyse the livestock composition, population pattern and factors affecting it in the arid zone of Rajasthan. For the purpose of study, the secondary data of livestock population pertaining to animal census years 1961, 1966, 1972, 1977, 1983, 1988, 1992 and 1997 were collected. For the estimation of fodder availability, data on crop production, fallow land, culturable waste, forest area, etc., were collected for the year 1996-97. The requirement of fodder and nutrient intake was also estimated for the region. The study revealed an increase in buffalo population in the region while a sharp decline was observed in per cent share of cattle in the total livestock population. The major deficiency of fodder was felt in the case of ovines in the arid region. The factors responsible for increase in buffalo population are increasing cropping intensity and rural population density in the arid
region while the same factors resulted in a decrease in cattle population. The arid region farmers also adopted buffalo as drought resistance strategy since unproductive buffalo can be sold during drought, which does not affect the religious sentiments as in the case of cattle. The study recommends storage of forage produced in good monsoon year for use in the deficit period. The Government of India is also implementing a scheme for this region to develop and rejuvenate the pasturelands available on a large scale to improve the livestock situation in the region.

Shiyani, R.L and Singh, R.V. (2004) observes that the combination of crop livestock enterprises contribute to the livelihood sustainability in several ways and at the same time, would also result in environment friendly management systems. The exact composition of crops and livestock enterprise will vary in different regions based on agro-climatic conditions and resource endowment in different socio-economic groups. This study aims to identify and estimate the profitability of major livestock-crop production systems in Gujarat state. A cluster of three villages from each agro-climatic zone was selected and a complete enumeration of 25 villages was done. Thus, a total of 2,793 households were enumerated during the year 2001-02. In all, 49 livestock-crop production systems were identified from the entire state. On the basis of probability proportion, a total of 150 respondents from each zone were finally selected, thus, making a total sample size of 1,200 respondents. The primary data were collected by survey method through well designed and pre-tested questionnaires.

The major findings of the study revealed that, buffalo + paddy + fallow + summer paddy + sugarcane production system gave the maximum annual net profit of Rs. 26,904 over cost C-2 in Zone-I, whereas buffalo + crossbred cow + sugarcane emerged as the most profitable system not only in Zone-II (Rs. 64,298) but among all the systems of Gujarat state. In general, buffalo + groundnut + fallow + fallow systems and buffalo + groundnut + wheat
fallow systems were found to be most profitable in North Saurashtra and South Saurashtra zones, respectively. The profitability of different systems was found relatively less in the case of Bhal and Kutch zone. The study suggests that concerted extension efforts need to be made to popularise the most profitable production systems among the farmers or livestock owners of the respective zone. The government must also accord higher priority to create better infrastructure and marketing facilities of the profitable enterprises.

M. Jayachandra Reddy et al. (2004) The paper attempts a comparative study of economics of milk production in three states, viz., Chittoor district in Andhra Pradesh, Erode district in Tamil Nadu and Kolar district in Karnataka involving aspects related to existing cost structure of milk production, profitability of crossbred dairy cows in the three states under the changed socio-economic-political scenario and also suggests methods to improve the viability and profitability of these enterprises. The data were collected by survey method during the year 2003. Seventy five farmers were selected at each location giving due importance in the selection of all categories of households. The number of dairy cows studied were 108 in Chittor, 178 in Erode and 84 in Kolar districts. The net cost of maintenance of a crossbred cow per day was worked out to Rs. 38.99, Rs. 49.36 and Rs. 48.88 in Andhra Pradesh, Tamil Nadu and Karnataka respectively. The cost per litre of milk worked out to Rs. 5.48, Rs. 7.20 and Rs. 5.84 in the same order. Feed cost was the major component in gross cost which accounted for 63.88 per cent in Andhra Pradesh, 72.14 per cent in Tamil Nadu and 73.62 per cent in Karnataka. The net profitability varied from 43 per cent in Tamil Nadu, 70 per cent in Andhra Pradesh to 83 per cent in Karnataka. The variations among the three studied locations are due to variation in breed, feeding pattern, maintenance of animals, etc. The study has further brought out the fact that higher fat content provides higher prices as milk is priced based
on fat and Solid-Not-Fat (SNF) content by dairies. Hence proper/scientific breeding procedure is to be followed to improve fat content in the milk as well as milk production per animal. Besides scientific breeding, feeding, treatment and veterinary care and management would not only increase milk production and fat content in addition to reduction in cost, but also incomes of farmers. Thus dairy farming is considered as an 'instrument for socio-economic change' in rural areas.

Saikia, Anuva (2004) conducted the present study in six districts selected from six agro-climatic zones of Assam covering 900 households. The study discusses about the structural Rajasthan. Data were collected using pre-tested personal interview schedule during the year 2000-01. The findings of the study clearly revealed that non-availability of green fodder round the year, lack of artificial insemination facilities, lack of improved breed of milch animals, lack of training about improved practices and lack of knowledge about improved practices, low risk bearing capacity, high cost of fodder and concentrates, high cost of modern medicine, non-availability of loan facilities, lack of initiative and motivation, traditional attitude of people, uncertainty of monsoon, lack of information about various development programmes, and non-availability of extension services were the major constraints confronted by the farmers in the adoption of improved animal husbandry practices. There is a need to keep all these constraints in mind while developing any transfer of technology or extension programmes meant for the farmers of arid fringes in order to popularise the improved animal husbandry practices.

Singh, Naresh & Sidhu, J.S. (2004) the present paper is based on a study carried out to examine the natural integration of livestock economy with crop economy of small and marginal farmers. From the selected block, four villages were selected and a sample of 50 marginal farmers with less than one hectare and 50 small farmers with 1 to 2 ha of operational holdings were selected. The study revealed that dairy farming accounted for more
than one-third of land and farm investment, more than two-third employment of family labour, 60 to 90 per cent of the family income and more than one-third of the domestic expenditure of the small and marginal farmers. The viability of these small economies rests on the optimum integration of dairy with crops by utilising their scarce land resource and surplus family labour. Although, the small and marginal farmers were able to minimise the gap between existing and potential productivities of different crops, they failed to bridge the gap in the case of milk animals. The study suggested that a lot of efforts are required on the part of the government and other development agencies to develop high milk-yielding animal breeds, milk production technologies supported by training and extension service, credit, animal health service and effective pricing policy through co-operative milk marketing facilities, to make these tiny enterprises viable.

Kamble, S.H. et.al. (2004) made an attempt to empirically examine whether the existing dairy enterprise is optimum or needs overhauling either partially or completely based on data collected from 100 farmers spread over in five villages in Chiplun block of Ratnagiri district of south Konkan region of Maharashtra during the year 2000-2001. The findings of the study revealed that the cropping pattern on all categories of sample farms is dominated by cereals especially rice in kharif season while the proportion of area of under fruit crops is to the tune of 10 per cent. On all purposively selected sample farms, the shares of local and crossbred cows and buffaloes were to the extent of 12 per cent, 68 per cent and 20 per cent respectively. The dominance of crossbred cows was the effect of Intensive Cattle Development Programme. However, possession of crossbred cows was on an average more or less same on small and medium sample farms while it was higher on large farms. Interestingly, it was observed that there was no significant difference in the maintenance costs of maintenance of local cows, crossbred cows and buffaloes though there was substantial and significant difference
of costs between these types of milch animals. The results have shown that the crop production activity resulted in loss on small and medium farms, while it was profitable on large farms. The study concludes that dairy enterprise helps in minimising the economic losses on small and medium farms while replacement of local milch animals with crossbred augment the net income substantially on all farms.

Singh, R.K. et.al. (2004), the present paper focuses on the livestock wealth and attempts to work out the trends in production of milk, meat, eggs and other products in Uttar Pradesh for judging its future potential. The analysis is based on census and secondary data obtained from various sources. The analysis of data indicated that the annual compound growth rate of agriculture was 2.3 per cent during the 1990s as against 2.9 per cent in the 1980s. Crop, livestock, fisheries and forestry constitute the core sectors of agriculture. Crop sector is the principal source of generating income in agriculture followed by livestock sector. The share of crop sector has declined by 3 per cent from 79 per cent in TE 1981-82 to 76 per cent in TE 1997-98. The share of livestock sector, on the other hand, has grown by 6 per cent from 18 per cent in TE 1981-82 to 24 per cent in TE 1997-98, while the share of forestry and fisheries is too meager in the state. Livestock sector, thus, is an important component of agriculture. This sector is growing impressively in Uttar Pradesh. It is reflected from the increasing share of livestock in the gross value of agricultural output from 18 per cent in TE 1981-82 to 27 per cent in 1999-2000. Annually the state produces more than 11 million tonnes of milk and over 116 thousand metric tonnes of meat from buffalo and small ruminants. The share of milk production has grown impressively in the value of livestock output. The potential of this sector has not yet been fully realised. This sector has still great potential to raise the income of the small farm holder and act as an important source of livelihood for the small and marginal farmers. Unlike land, the small and
marginal farmers own greater share of cattle and buffalo than the large farmers do. Special emphasis should be laid on this sector to raise income and generate employment opportunities for the landless labourers, marginal and small farmers. The markets are not efficient for trade in livestock and livestock products. Marketing of livestock animals, cattle, milk and milk products, meat (goats, poultry and pigs) and eggs; wool hides and skins is inefficient in Uttar Pradesh. Hence efforts are required to improve the marketing requirements and production technologies have to be tied together, which would boost the sector. The study has suggested that market prices, practices and facilities should be designed in such a way as to give favourable net returns to the farmers.

Tomer, B.S. et.al. (2004) an attempt in the paper (i) to study the trends in bovine animal population and composition of livestock on different size of farms, (ii) to analyse the costs and returns of dairying enterprise on various farm sizes and (iii) to identify the major constraints in promoting the dairying enterprise in Haryana. The study is based on cross-sectional data for the year 2001 collected from 180 farmers from two zones of the state, i.e., western zone, representing the semi-arid region and the eastern zone, representing the higher irrigated area. A stratified random sample of 90 farmers of three size groups of land holdings was taken from one district of each zone. The selected farmers were grouped under three categories, namely small, medium and large having less than two hectares, two to four hectares and more than four hectares respectively. Besides secondary data for the bovine livestock population of the state were also taken for the period 1966-1997. The findings of the study revealed that the population of indigenous cattle has been declining in the state of Haryana. However, there was a sizeable increase in the number of crossbred cows since 1980. The rising trend in the buffalo population indicated that the buffalo as milch animal was preferred to cows for its higher milk potential than indigenous
cows and higher fat content in its milk than crossbred cow-milk. Further, declining population of draught animals in the state on account of mechanisation of agriculture was facilitating the farmers to maintain more number of milch animals particularly buffaloes.

The analysis of field data, on sample farms indicated that the average number of livestock was 5.7 in the western zone and 7.2 in the eastern zone. Further, most of the livestock maintained on the sample farms in both zones included buffaloes in western zone whereas in eastern zone, farmers also maintained crossbred cows in addition to the milch buffaloes for milk production. The average share of livestock in the value of total farm assets was 18 per cent and it increased with decrease in the farm size. The per farm milk production also increased with an increase in the size of farm since herd size increased with the farm size in both the zones.

The average cost of maintenance of milch animals decreased with an increase in the herd size due to economies of scale. Among the different components of maintenance cost of milch animals, feed cost was the maximum constituting half of maintenance cost. The major constraint in dairying enterprise was observed to be unorganised marketing system for milk in rural areas followed by inadequate health care, lack of artificial insemination facilities, uncertainty about the breed of cows and buffaloes, low fat content in crossbred cow milk and poor quality and high priced feeds available in the market. The study thus revealed that the livestock maintained on the farms in the state constituted mainly the bovine milch animals and its size was positively correlated with the size of land holdings. However, with per unit of land area, the number of livestock declined sharply. This in turn indicates that the small farmers increase their volume of business through maintaining proportionately higher number of milch animals per unit of land area than the large farmers. The dairying enterprise therefore, was providing employment to the unemployed and under-employed rural work force. Thus, the development
of dairying in the state can go a long way towards enhancing the income and employment, in addition to the complementary and supplementary relationships of dairying with crop enterprise.

Pal, P.K. (2004) made an attempt in this paper to examine the growth and composition of livestock products across the states in India during 1994-95 to 2001-02. The study is important even at lower income levels. As income levels rise, the importance of livestock products in the consumption basket also increases.

Kumar, Vinod (2004) observes that cheap imports of livestock products are a matter of concern for the Indian livestock industry, particularly for millions of small, marginal, and landless dairy farmers. India is committed to zero import duty for milk powders and comparatively low tariffs on other major dairy products such as butter, butter oil, cheese, and fresh milk (fat content more than 6 per cent). Unlike major dairy producing countries, India does not have special agricultural safeguard provisions for livestock products. In contrast, the bound rates of tariff for dairy products in most of the developed countries are very high. This paper attempts to examine these issues in the context of export prospects of livestock products, the implications of World Trade Organisation (WTO) negotiations on the export of livestock products, its dimensions and determinants, and also suggests measures for export promotion. The paper is based on secondary data collected from different published sources for the period 1981-2002. The data were analysed using simple tabular analysis and compound growth rates for the livestock products were worked out for the period 1981-2002 and three sub-periods, viz, pre-liberalisation period, 1981-91; post-liberalisation period, 1991-2002 and post-WTO period, 1996-2002, by using standard formulae. The study indicates that after liberalisation and WTO, export of livestock products like meat and meat preparation, cheese, butter, ghee, bovine meat, buffalo meat, chicken meat, and eggs increased by a remarkable
The paper suggests that India's export of livestock products can be increased if the production and trade-related distortions are brought down, if not eliminated. Since the international prices of meat and dairy products and also the exchange rate are outside the direct influence of the government, enhancement of the competitiveness of Indian products can be done by bringing down the domestic prices, reducing cost, raising productivity and efficiency in production, processing, transport and marketing. The country, in the short-run, should try to promote export of livestock products to the neighbouring countries where similar or lower quality standards exist. However, the long-term strategy must be in creating efficient institutional framework to comply with the SPS and TBT provisions so that the huge potential of future world market for livestock products can be harnessed. With the removal of quantitative restrictions, it would be difficult for Indian products to compete with the highly subsidised milk products of the developed countries, even in the Indian market. As the Indian dairy industry is already facing stiff competition because of heavy subsidies by the developed countries, the value added taxes on dairy industry in India have to be brought down to negligible levels.

Ashok, K.L. & Somasundarm, G. (2004) estimated the determinants of livestock size and the crop-livestock linkages in small farms of southern Tamil Nadu. The data were collected from 60 small farmers from six randomly chosen villages from three southern districts, namely, Thirunelveli, Thoothukudi and Virudunagar of Tamil Nadu. The results indicated negative change in the size of livestock between 1993 and 2003 for all categories. The employment generation in the livestock sector in the small farm on an average was 461 hours of work per month of which 82 per cent was for family labour. Among the family labour, males contributed 44 per cent and females contributed 38 per cent and the rest by children. Functional analysis revealed that 41 per cent of the variation in the size of the livestock population was explained...
by the specified independent variables. The total inputs from livestock sector to crop sector was Rs. 9,823.85 on an average, with farmyard manure accounting for 44 per cent. Similarly the total inputs from crop sector to livestock sector was Rs. 2,853 with straw accounting for 45 per cent of the value. The estimated backward linkage of crop sector or forward linkage of livestock sector was 0.37 and forward linkage of crop sector or backward linkage of livestock sector was 0.19. It means while the crop sector utilises 37 per cent of the value of livestock sector, the livestock sector utilise only 19 per cent of the output from crop sector.

Subramanian, M. and Verma, N.K. (2004) conducted a study in 2003 in Kangayam and Gopichethipalayam blocks of Erode district of Tamil Nadu with the objectives of estimating age-specific cost of calf rearing for indigenous, crossbred cattle and buffalo calves and to work out the district of Chhattisgarh. The study found that the largest proportion of cost was incurred on feed and fodder at 62.46 per cent. The average total cost per milch animal per day at Rs. 92.97 was quite high in comparison to the net return of Rs. 3,435.24 per bovine stock. Benefit-cost ratio was found to be 1.10 indicating great scope for improvement in milk productivity. The share of buffaloes was 67.22 per cent of the gross returns with an average milk yield of 8.22 kg per day per animal. The study points out that high initial capital expenditure of Rs. 18,418.69 per milch animal, inefficient cost of production, as high as 62.46 per cent on feed and fodder alone, low genetic potential of indigenous breeds, diminishing common property grazing pastures, animal health problems, inefficient marketing and poor infrastructural base related to production, processing and transportation, as some of the major constraints in realising the potential of dairy sector. Based on the findings of the study, the paper suggests application of biotechnology in improving productivity of bovine stocks, preventive animal health care as an incentive for higher productivity, artificial insemination
and vaccination programmes, large scale credit support, particularly to small farmers with flexible financial terms and repayment schedules, efficient credit delivery mechanism, organised co-operative marketing on the pattern of AMUL model, cost effective production and availability of feed, fodder and forages at farm gates, common property pastures and grazing land as areas for development of grasses and forages and strengthened extension activities for the growth and development of the dairy sector.

Ramachandran, T. (2004) The study attempts to explore the income and employment potential of dairy farming in different stages in Kanyakumari district of Tamil Nadu and suggest possible remedial measures. Primary data were collected from 100 farmers engaged in farming activities of five selected villages of Kanyakumari district. The information given by the respondents are represented in the analytical process. The study revealed that dairy farming is an activity with great potential and has offered considerable scope for employment and income generation in Kanyakumari district, which is basically rural in nature. Dairy farming activities are concentrated throughout the district. Lot of milk co-operative societies have been established for promoting the welfare of people engaged in dairy farming. From the above analysis, it is inferred that, dairy farming gives employment opportunities in the form of collecting dung, cleaning shed, watering and feeding animals, grazing and cutting grass, milking, sale of milk, processing of milk and marketing of milk and milk products to a large number of people in the villages of Kanyakumari district. Further, it is found that the income is generated in the form of sale of milk, manure and sale of cattle. It may be concluded that dairy constitutes the major proportion of the cattle population in the sample households. Cattle rearing occupies a pivotal place among women folk of the rural areas. Thus, dairy farming plays the main source of employment and income generation in the study area.
Institutional Innovations in Governments: Experience of Women Dairy Project in Rajasthan:

Rao, V.M. (2004) Made an attempt to examine the performance of Women's Dairy Project formed as part of the Support to Training and Employment Programme of the Department of Women and Child Development, Ministry of Human Resource Development, Government of India, its progress in Rajasthan and its impact on women. Primary data were collected from 210 women producers randomly drawn from seven milk unions during October 2002-February 2003. It was observed that initially men discouraged women to enter a democratic organisation like women dairy co-operatives (WDCS). Women, slowly but steadily, realised the importance of coming together and expressed solidarity. Assured milk marketing, regular payment, supply of quality inputs at a reasonable rate, and continuous monitoring helped them to repose faith in WDCS. They actively participated in WDCS's day-to-day management. Despite increase in workload, women are happy because their status in the house and village has improved and they are more demanding now. Increased incomes helped in maintaining a reasonable standard of living. Thus, WDCSs are working successfully and contributing positively to every aspect of the lives of women. This in turn has led to social, political, economic and psychological employment of women. Unlike earlier government programmes for emancipation of women, STEP programme provided support in terms of policy finance and enabling environment. Further, services release mechanism was made simple and there was hardly any restrictive intervention by the government. As the women are more close to environment as also have higher concern for the community, they actively participated in the decision-making process which contributed to the success of WDCSs. Development process became more equitable through women's active participation.
Role of Livestock in Diversification of Farm Economy at Varying Levels of Sodic Soil Reclamation Technology Adoption in Haryana

Tripathi, R.S. et al. (2004) conducted a study in Haryana to evaluate the contribution of milk enterprises in the diversification of farm income at varying levels of sodic soil reclamation technology. For the purpose of study, an intensive enquiry of 168 farmers, spread over 8 villages of four blocks in Karnal and Kurukshetra districts of Haryana, was made during the years 2001-2002 and 2002-2003 to collect data on livestock and crop enterprises with reference to various levels of sodic soil reclamation technology adoption. Fifty respondents from a cluster of two villages were chosen on random basis. The study revealed that the average size of holding was 5.07 ha out of which 64.26 per cent area was sodic (alkali). These sodic soils have been brought under cultivation after reclamation with chemical amendment, namely, gypsum. Based on the quantity of gypsum applied for sodic soil reclamation, the selected farms were categorised into four levels of reclamation technology adopters, viz., very low (amendment applied >5.75 t/ha), low (5.75 to 9.50 t/ha), medium (9.50 to 13.25 t/ha) and high (>13.25 t/ha). Rice-wheat cropping pattern was followed exclusively on all the farms covering more than 90 per cent of the total cropped area, where two fodder crops, namely, sorghum in kharif and berseem in rabi season occupied 3.68 and 3.82 per cent of the cropped area, respectively. Almost all the selected farms had 100 per cent irrigation facility and 4-5 milch animals of good quality breed. The proportionate gross income earned from milk production showed a decreasing trend with the increase in the level of sodic soil reclamation technology adoption on the farms. It was mainly due to the fact that the performance of crop enterprises was better and contributed more to the farm income at higher levels of the reclamation technology adoption. As against this, the performance of milk production enterprises was remarkably better on lower level reclamation technology adopter farms where the farmers have to compensate...
their poor crop income by increased earning from the milk enterprise. A similar trend was noticed in case of contribution made by milk production to net farm income. The study concluded that, in general, milk production has made a visible impact on diversification of the farm economy at all the levels of sodic soil reclamation technology adoption, and more favourable, in particular to those farms where crop enterprises were less supportive to the farm income because of low levels of the reclamation technology adoption.

Sujatha, R.V. et.al. (2004), Made an attempt to study the market structure, price spread, marketing costs and marketing efficiency for milk in the co-operative and private sectors of Andhra Pradesh. A total of 120 milk sellers was selected randomly from four districts, viz., Guntur, Krishna, Nellore and Prakasam of Coastal Andhra region and four milk plants - twomilk plants each from co-operative and private sectors were selected. The market structure analysed using Hirschman-Herfindahl index for the presence of monopoly indicated the H value of 2.31 per cent, denoting the lack of monopoly in milk marketing. To estimate seller's concentration, Bain's classification was used according to which farmers are said to constitute a “atomistically competitive” market. Four marketing channels were identified for milk marketing in coastal Andhra region. It was found that producer's share in consumer's rupee is the highest in Channel I. Pricespread was minimum in Channel I and highest in Channel IV. The highest price spread is due to the fact that the intermediary incurred some costs and retained some portion of profit, which added to the inflated price spreads. Channel I was found to be the most efficient channel with a marketing efficiency of 94.81 per cent. It was observed that in all the channels price paid to the producer was high in the private sector compared to co-operative sector. It was also found that price spread was less in private sector and hence the consumer price was also less. The major constraints identified in milk marketing were high feed
cost, inadequate price for milk, poor credit facilities, disease outbreak, etc. Because of delay in the payment of fee for the milk sold to the co-operative society, the farmers approached the private firms. For enhancing the marketing efficiency of milk, infrastructure facilities like chilling plant, pasteurisation and dairy products processing plants have to be developed.

**Duhan, V.K. et.al. (2004)** The paper is based on a study conducted with reference to 120 respondents scattered in six villages of two blocks in Rewari district of Haryana to analyse the nature of markets and role of co-operatives in marketing of milk. It was observed that on medium and large category of farms the milk sold through co-operative society was found to be higher than the disposal through milk vendors and directly to the consumers mainly due to more marketable surplus. While on small farms the disposal was found to be almost equal, i.e., 35 per cent through milk vendors and directly to the consumers, and the disposal of milk through co-operative society was less due to lower marketable surplus owing to smaller herd size. Further, it was observed that although there is difference in the average quantity sold through different channels, yet it was found non-significant. The small category of farms were selling relatively lower share through co-operatives in all the three seasons while medium farmers accounted for a higher share in all the three seasons. The study noted that the share of producer in the consumer rupee could be increased by strengthening the co-operative sector. Thus, there is a need to expand the milk co-operative sector.

**Sunandini, G.P. et.al. (2004)** Mixed farming practices like crop-animal systems are very complex and vary depending on the physical, biological and socio-economic parameters. Complete rations/diets developed to suit the needs of the production system area would not only help in substantially reducing the cost of feeding but also enhance the productivity of livestock and would automatically become a source of higher income generation system.
among rural masses. In this context, several combinations of economic complete rations were formulated using the locally available feeds and fodder and were evaluated with on-farm studies involving potential farmers located in the sugarcane based production system area of West Godavari district of Andhra Pradesh. The daily economic gain noticed in on-farm trial ranged from Rs. 2.80 to 7.24 per calf by feeding male buffalo calves with complete diets containing sugarcane by-products and crop residues in comparison to traditional feeding. The formulated feeding ration resulted in an additional milk yield of 2.79 litres/buffalo/day with fat increase of 1.9 per cent. This feeding technology is highly sustainable because the suggested feeding system will take care of feeding of livestock for higher productivity during sugarcane crushing season, i.e., from November to mid-April every year during which period, there will be shortage of fodder resources at the farmers' level. When buffalo calves are integrated with sugarcane farming, an additional income of Rs. 18,000 per annum could be earned by the farmer. The exante impact assessment of this feeding technology in East and West Godavari districts of Andhra Pradesh indicated high benefit-cost ratios. The results of the sensitivity analysis indicated that the net present value, benefit cost ratios reduced significantly with the reduction in yield and more significantly with the reduction in adoption. Hence large scale extension activities are required for popularising the technology in order to acquire the full benefits of augmenting the farm income.

Varghese, K.A. and Meena, Phool Chand (2004) Made attempts to assess the composition of livestock population and the available technological support on the basis of ten agro-climatic zones followed for agricultural research and development programmes in the state of Rajasthan. The maximum growth in livestock population was observed in the arid desert belt of the state. The Alwar-Bharatpur region recorded the lowest growth in the total population. The density of total livestock worked out to 159 animals/sq.
km. in 1997 which is higher than the human density in the same year. Remarkably the Zone III-B emerged as the highest density region. The high density regions are the low growth regions for livestock in the state. While high dense regions for cattle fall in the South and South-eastern part of the state, buffalo is more dense in Zone III-B which has more market access due to its closeness to Delhi. The goat density is more even across different agro-climatic regions. The sheep density is more in the semi-arid belt. As far as infrastructural support like hospital, dispensary, mobile hospital, etc. is concerned, one such unit is expected to serve 23,487 animals for the state as a whole which again varied between 13,843 animals in Zone III-B to 47,588 animals in Zone I-A. In regard to animal health management and extension services like treatment, supply of medicines, castration, vaccination, artificial insemination, camps, etc. Zone IV-A had the maximum number of treatments and medical supply. Maximum castration took place in Zone II-A. Vaccination was maximum in Zone II-B. The Jaipur region outnumbered other zones in respect of artificial insemination.

**Employment and Income Generation through Livestock Based Milk Processing Units in Rural Haryana**

_Tuteja, Usha and Singh, N. (2004)_ The main objectives of the paper are: (i) to examine the status of India in world milk production and milk trade, (ii) to assess the performance of milk production in Haryana during the past two decades, (iii) to estimate the employment and income in milk processing units of different sizes and (iv) to analyse the marketing channels and price spread of milk products. The study is based on both micro and macro level data. The micro level data were collected through a survey of 15 milk processing units spread over the rural areas of Gurgaon and Jind districts. These included Own Account Manufacturing Enterprises (OAME), Non-Directory Manufacturing Enterprises (NDME), Directory Manufacturing Enterprises (DME) and factories. Gross returns, cost, net returns and employment per
unit have been estimated separately for Gurgaon and Jind districts. The major conclusions of the study are (i) India is the largest producer of milk in the world but it is a non-entity in the international market of milk and its processed products. Recently, its share in world exports of milk powder and butter has increased marginally, (ii) A state-wise analysis of milk production in India is indicative of the larger shares of Uttar Pradesh, Punjab, Rajasthan, Madhya Pradesh, Maharashtra, Gujarat, Haryana, Karnataka and Tamil Nadu than the rest of the states. Haryana contributed 5.88 per cent in the total milk production in India, (iii) The production of milk in Haryana grew at the rate of 4.07 per cent per annum during 1980-81 to 2000-01. Therefore, milk processing on a commercial scale has great potential in terms of enhancing the income of the farmers by selling milk products in the expanding domestic and international markets, (iv) The selected milk processing units produced paneer, khoya and milk cake. The per day per unit gross returns in Gurgaon and Jind districts were Rs. 15,066 and Rs. 7,893 respectively and the net returns worked out to Rs. 2,869 and Rs. 1,591 respectively. The income of factories in both the districts was found to be the highest due to economies of scale. But, the returns of own account enterprises were the lowest because milk processing for these units was a family affair, (v) The marketing of milk products was done through usual channels, which involve commission agents, wholesalers, retailers, contract parties and consumers. Most of the small processing units of milk products sold their output within the village directly to the consumers or through the village shopkeeper. But the large producers sold their output outside the village in big markets. (vi) The producer's share in the consumer's rupee was 85 paisa for khoya/pancer and 80 paisa for milk cake. Thus, price spread was found to be low in case of milk products. (vii) The milk processing units on an average generated employment of 8.40 persons in Gurgaon and 5.86 persons in Jind district. The factories generated the highest employment of about 14 persons in the former and 11 persons in the latter district. (viii) The milk processing units
didnot face problems regarding raw material (milk) and labour. (ix) The future potential of milk processing in Haryana is great due to strong raw material base and increasing demand for milk products. The commercial milk processing which do not show substantial employment at present but given the rising national and international demand for these products and the easy availability of milk in the state, hold a good promise in terms of creating employment and income. Therefore, a well thought out strategy should be framed and implemented rigorously in the near future. The study highlighted that marketing of local products faced severe competition from the multinationals. Hence, promotional policies need to focus on the marketing bottle-necks and devise efficient marketing channels through public and private partnership. Special zones can be created in those areas where raw material/milk is easily available. The alternate way could be formation of co-operatives like Amul.

Rauf, A. and Mushtaq, I. (2004) The paper reviews the changing pattern of growth in livestock sector in the country. The growth of milk population has increased to the tune of 6.3 per cent during the period of 1996-2001. The current milk production of 84 million metric tonnes has put the country in the leading list among the developing nations. The contribution of livestock to agricultural gross domestic product has increased from 18 per cent in the 1980s to 22 per cent in the 1990s. The livestock sector has considerable potential to contribute towards alleviation of problems of unemployment and poverty as 71 per cent of cattle, 63 per cent of buffaloes, 66 per cent of small ruminants, 70 per cent of pigs and 74 per cent of poultry is owned by marginal and small land owners. But the productivity of livestock population is poor on account of scarcity of feeds and fodder, occurrence of deadly diseases, replacement of low yielding indigenous stock with high-yielding cross breeds are the major stumbling blocks in overall improvement in livestock situation in India. It indicates that technology
would be key factor in sustaining the growth of livestock sector in the
decades to come.

income and reducing the risk of marginal and small farmers of West Bengal.
A sample of 80 respondents have been covered purposively from Malda
district, a traditional belt of mulberry silk of West Bengal during 2001-02.
Data from four mulberry crops, Jaistha, Bhaduri, Agrahayani and Chaitra
of which two seasons are known to be risky and livestock for three seasons
(summer, rainy and winter) have been taken for the analysis. The study
observed that majority of the farmers maintained local breed of livestock,
namely, cow. Livestock fetches a price of only Rs. 409 and Rs. 521 per
cow per year which is much less as compared to sericulture. Mulberry
farmers on an average received Rs. 5.21 for every rupee invested in sericulture
whereas the corresponding figure for livestock is only 1.24. Family labour
employment is also much higher in livestock sector (89.50 per cent) as
compared to sericulture (87.18 per cent). Variation of yield in livestock is
found to be much lower as compared to sericulture. During unfavourable
season, the yield of sericulture comes down by more than 60 per cent
which is much higher than yield from livestock. This shows that livestock
can provide more stable returns as compared to sericulture. During unfavourable
seasons of sericulture, livestock may give assured return to stabilise the
total income of the marginal and small farmers. Thus, livestock is a resourceful
enterprise which can also reduce the risk for sericulture farmers.