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Impact of Milch Animals Scheme of IRDP on Agricultural Labourers: A Case Study of Kamarajar District in Tamil Nadu

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Under the milch animals scheme of Integrated Rural Development Programme, milch animals are provided to the poor agricultural labour families to create subsidiary employment opportunities. During the Seventh Plan period, more than 73 per cent of the agricultural labour families received benefits under this scheme in Kamarajar district of Tamil Nadu. The present study attempts to analyse the impact of the milch animals scheme (MAS) on the income and employment level of the agricultural labour families in Kamarajar district. Three villages entirely covered under this scheme in the Srivilliputtur block were selected for the study. At the respondent level, from the list of beneficiaries covering 20 scheduled castes/tribes (SC/ST), 20 backward castes (BC) and 20 other castes (OC) and 30 non-beneficiaries, 10 each from SC/ST, BC, OC were selected randomly from the three villages. Primary data were collected from 60 beneficiaries and 30 non-beneficiaries by personal interview method during the period April 1990 to June 1990.

The study revealed that in the year following the implementation of the scheme, both the beneficiary and non-beneficiary farms increased their income which was due to the general economic development (may be higher wages or general inflationary effect). Non-beneficiaries gained an annual income on a small scale (Rs. 416, Rs. 436 and Rs. 218 only) while the beneficiaries gained as much as Rs. 1,838, Rs. 2,038 and Rs. 2,560 per farm on an average for SC/ST, BC and OC respectively. Dairying added more than 180 man-days of work per farm and it was the largest for SC/ST who maintained two cows and the employment generated was 189 and 181 man-days for BC and OC families because they maintained only one cow per farm. The milch animals scheme has helped women workers to achieve full employment and generate employment for male workers by 81, 60 and 86 man-days in SC/ST, BC and OC farms respectively. The results also showed that there was scope for further additions to the stock of milch animals to profitably use the under-employed labour still available. Therefore, the scheme should be continued and intensified.

Contribution of Dairy Co-operatives to the Income of Milk Producers in Saurashtra Region - Modified Decomposition Analysis

R.L. Shiyani†

An attempt is made in this paper to empirically examine the contribution of the dairy co-operatives to the income of member milk producers in Saurashtra region. Junagadh District Co-operative Milk Producers' Union (JDCMPU) Ltd. was selected randomly and four dairy co-operatives were selected at random from the JDCMPU Ltd., and a total of 131

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member and 131 non-member milk producers were selected from these four dairy co-operative villages. The total milch cows and buffaloes owned by the members were 64 and 139 respectively, while the corresponding figures for non-members were 78 and 117. The input-output data were collected and analysed separately for three different seasons of the agricultural year 1992-93. Cobb-Douglas production function was employed to estimate the parameters influencing milk production. Moreover, a modified form of the decomposition analysis was used to examine the contribution of dairy co-operatives in generating the income of member milk producers.

The findings of the study revealed that the concentrates and labour charges had greater bearing on the milk production process both in the case of member and non-member milk producers. The dairy co-operatives brought about an immediate upward shift in the gross income of members. However, the total change in the gross income between members and non-members was substantially higher in the case of buffalo milk production as compared to cow milk production. Among the different inputs, the allocation of labour charges and green fodder was found better in the case of members maintaining buffaloes or even cows. Therefore, in future, if the emphasis is made on the development of green fodder and better management, it will be favourable to the members of dairy co-operatives. Similarly, the weightage on the development of concentrates, i.e., balanced cattle feed would result in higher income to the members of dairy co-operatives maintaining milch buffaloes.

Towards Livestock Economy in Vidarbha Region

V.N. Autkar, K. Rup Kumar and M.R. Thokal*

The paper attempts to examine the components of livestock structure and its milk production in the Vidarbha region of Maharashtra and to work out the maintenance cost per milch animal in the region. The secondary data published in the District Statistical Abstract and Statistical Hand Book 1986 published by Directorate of Animal Husbandry, Maharashtra State are used. For working out the cost of milch animal in the region, secondary data collected through the Agricultural Prices Cell under the Department of Economics and Statistics, Punjabrao Krishi Vidyapeeth, Akola were used. The data pertained to the year 1989-90. Simple tabular analysis approach was used for the present study.

The main findings of the study are as follows: In the Vidarbha region, the breedable cows accounted for 34 per cent and buffaloes for 18.65 per cent of the respective totals in Maharashtra. The dairy industry in the Vidarbha region is cow oriented. Cow milk production in the region contributed 19.75 per cent and buffalo milk production accounted for 16.40 per cent of the total milk production in Maharashtra. The maintenance cost per milch animal in small, medium and large size-groups was about Rs. 1,669, Rs. 2,028 and Rs. 2,178 respectively and the overall cost being Rs. 1,914. The major items of maintenance cost were feed, human labour and interest on working capital. At the overall level, feed cost contributed

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about 65 per cent of the total cost. The net returns per milch animal per annum was Rs. 521, Rs. 409 and Rs. 264 in small, medium and large size-groups respectively. The input-output ratio in milk production worked out to 1.31, 1.20 and 1.12 in these three size-groups respectively, with the overall average being 1.22. It is further observed that the maintenance cost per milch animal and milk yield increased with the increase in the size of holding. The conclusion that emerges from the present analysis is that livestock production is at a sub-optimal level and there is great scope for expansion of livestock enterprise through cross-breeding technique, better feeding and better breeding practices which would not only increase the returns from livestock to farmers but also generate employment opportunities in the rural sector. Besides, the spread of dairy co-operatives for the marketing of milk with assured price may boost up milk production.

A Study on Efficiency of Input Factors in Sheep Farming in Anantapur District of Andhra Pradesh

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An attempt is made in this paper to examine the efficiency of various input factors influencing the returns of the sheep farmers and to suggest the reallocation of resources to improve the efficiency of resource use in order to increase the returns. Anantapur district of Andhra Pradesh was purposively selected for the study. Two mandals, four villages and 96 sheep farmers were chosen by multi-stage sampling design. The respondents were categorised into three groups, viz., small (below 50 sheep), medium (50 to 99 sheep) and large (100 and above). From the categories so made 32 farmers from each group were randomly selected for the study. The data for the year 1990 were collected with the help of pre-tested schedules and multiple linear regression technique was used to find out the influence of the various independent variables on the dependent variable, that is, returns.

The results of the study indicated that the flock size made the highest contribution to gross returns in sheep farming in all the size-groups. Veterinary medicines also contributed significantly to the gross returns. It was observed that excessive human labour was used. It is recommended that the flock size should be increased to realise higher returns. Institutional finance may be provided to small and marginal farmers for purchase of stocks to maintain the optimum size of the flock. There is also a need to strengthen veterinary services and to increase the use of veterinary medicines in order to control the diseases and increase the returns. It is suggested that the excessive use of human labour should be curtailed to reduce the costs and increase the returns. There is need and scope for improving the efficiency of resource use by making suitable adjustments in the organisation of sheep farming.

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Current Trends in Milk Production in India

Brahm Prakash and Sushila Srivastava*

The paper attempts to analyse the changing trends in the composition of Indian livestock, the current status of milk production in India, the factors responsible for the trends observed in milk production, to evaluate the role of Operation Flood programme and to suggest a strategy to increase milk production in the country. The study is based on data collected from secondary sources. It is revealed that bovine population of the country recorded a growth of 40 per cent during 1956-89. The maximum growth was recorded in goats (80.7 per cent), followed by buffaloes (70 per cent). India accounted for 20 per cent of cows, 60 per cent of buffaloes and 20 per cent of goats at the global level. Uttar Pradesh has the distinction of having the maximum number of bovine population, followed by Madhya Pradesh, Bihar and Maharashtra. India recorded a growth of 236.8 per cent in milk production during 1950-51 to 1992-93. Uttar Pradesh was the largest milk producing state in India, followed by Punjab, Madhya Pradesh and Rajasthan. Per capita per day availability of milk has increased to 174 grams in 1994 from 132 grams in 1951 against the trends observed in pulses, meat, oils and total foodgrains. The contribution of buffaloes, cows and goats in total milk production was 51, 46 and 3 per cent respectively during 1990. Forty per cent of total milk is consumed in liquid form and some percentage is used for ghee preparation.

The Operation Flood programme has helped a lot in increasing the level of milk production but there are still several constraints. Local breeds of cattle with low productivity, insufficient and unbalanced cattle feed, unhealthy environment, concentration of animals in the rural sector, poverty and illiteracy of the milk producers, low level of processing technology know-how and poor marketing system are the major constraints in boosting milk production. Milk production can be increased by cattle breed improvement programmes, multiple ovulation embryo transfer technique, open nucleus breeding system, establishing deep frozen semen producing centres, improving cattle health, development of new varieties, raising the area under fodder crops and popularising highly productive varieties of these crops, mixing 2 per cent urea with green fodder, developing non-traditional cattle feed standards. The establishment of rural dairy plants, preparation of milk products through improved scientific technology and efficient and organised marketing system can also play an important role in raising the income and standard of living of milk producers and general health of all the countrymen.

Resource Endowment and Milk Production Economy: Some Reflections on West Rajasthan Districts

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The paper attempts to analyse the basic characteristics of milk production in the two neighbouring but contrasting districts, namely, Bikaner and Ganganagar of Rajasthan in

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order to understand the institutional support required to sustain the milk production base. Primary data were collected from 58 milch animal holding households selected from five villages of the two districts in May-June 1992 using structured questionnaire. The analysis is based on 149 milch animals comprising 124 indigenous cows and 25 buffaloes. The study reveals that the environmental factors influenced the extent of marketability of milk. In an area with superior resource endowment not only the basic characteristics of the agricultural systems differ from that of an area with weak endowment base, the relative economics of milk production also follow an identical pattern. The availability of sufficient crop residues exhibit direct impact in reducing inter-calving period, augmenting productivity and improving health status of the milch animals. However, in the desert district of Bikaner, dairying is adopted as a means of generating steady income round the year since the prospect for agricultural outputs are uncertain. The extent of commercialisation of dairying, therefore, is much sharper in Bikaner than in a district like Ganganagar where dairying, at best, provides an hedge against agricultural failures. The institutional support in the form of effective marketing outlet, remunerative prices, breed preservation, animal health care, insurance and softer credit and feed supplementation, etc., are essential for the sustenance of this vital sector of the rural economy.

Impact of Sheep and Goats on Farm Economy and Environment in Himachal Pradesh

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This paper examines two important questions, viz., (i) whether sheep and goats maintain ecological and environmental balance or create imbalance? and (ii) how do they influence the economy of shepherds living in the high altitude areas of Himachal Pradesh? Commensurate with these questions, the paper has been focused to quantify and elucidate the impact of sheep and goats on the farm economy and environment of the high altitude areas in Himachal Pradesh. It is based on a broad investigation conducted by the Department of Agricultural Economics, Himachal Pradesh Krishi Vishvavidyalaya, Palampur and sponsored by the Ministry of Environment and Forests, Government of India. The study was conducted in two zones, viz., high hills temperate wet zone III (1500-1800 metres above mean sea level) and high hills temperate dry zone IV (more than 1800 metres above mean sea level) of the state. The study relied on the data collected from 268 shepherd households, randomly selected from 57 villages in zone III (24 villages) and zone IV (33 villages). The primary data were collected by visiting the shepherd households through conventional survey method on an especially designed and pre-tested schedule pertaining to two agricultural years 1987-88 and 1988-89. The secondary data relating to pastures, forest area and number of sheep and goats, etc., were taken from different published/unpublished reports. The losses of ecology, environment and forestry degradation due to sheep and goats rearing/grazing were estimated by using information collected from forest range officers posted

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in the study area. The macro estimates of overall gains and losses in respect of sheep and goats at the state level were worked out through aggregation method, using the sample estimates. The shadow prices/opportunity costs have been used to quantify the overall impact of sheep and goats on the economy and environment/ecology in Himachal Pradesh.

The study concluded that in terms of bio-mass consumption cattle and buffaloes are more reducers of environment/ecology than sheep and goats in hilly areas. The sheep and goats in spite of having some negative impact on environment, have, in general, many positive repercussions too. The enormous cannot be compromised at all, keeping the economic and other gains (Rs. 4,913.95 lakhs) of this enterprise in view. The total losses of this enterprise were estimated at Rs. 2,813.91 lakhs, revealing that the economic gains exceeded losses, leaving a comfortable net margin of Rs. 846.04 lakhs after meeting all the opportunity costs. It is, therefore, suggested that this location-specific and valuable enterprise should not be discouraged as it provides livelihood to lakhs of people in difficult areas of higher hills. Also, there is an urgent need to expedite and monitor some counter measures like improvement in pasture management, plantation of fodder trees, etc., to improve nexus and create balance between ecology/environment and sheep and goats rearing so as to make the whole system sustainable in the far-flung and difficult areas of Himachal Pradesh.

Dynamics of Milch Animal Stock in Rajasthan and Its Implications for State Economy

Subah Singh Yadav†

The objectives of the paper are (i) to study the changes in the size and composition of milch animals in Rajasthan and its implications for the state economy, (ii) to examine the composition of milch animal stock at a disaggregated level and (iii) to assess the shifting milk economy over time and develop policy implications. For the purpose of the study, districtwise data of 14th and 15th Livestock Censuses were taken from the Office of Board of Revenue for Rajasthan. The composition of animal milch stock in the state has changed substantially. The percentage share of cattle has declined during the past four decades whereas it has witnessed an upward trend in the case of buffaloes which have emerged as major milch animal, providing support to commercial dairying. The percentage of animals in milk is quite low (32.67 per cent) but slightly on the higher side as compared to draught animals (28.49 per cent). The disaggregated analysis at the regional level indicates that the number of cattle has shown a decline in the eastern region (Alwar, Bharatpur and Dholpur) where mechanisation is taking place. With the buffaloes substituting for cows in milk here, the milk economy has gradually shifted from the northern Rajasthan to the eastern region. On the other hand, the percentage of cattle population is higher in the desert region and the density of cattle has almost doubled in Bikaner, Pali, Jodhpur, Sirohi and Ganganagar. Buffaloes have shown distinct growth compared to cattle in the eastern region, whereas their density is extremely low in Barmer, Jaisalmer and Bikaner (north western Rajasthan).

The proportion of adult stock and young stock at the state level was 62.26 per cent and

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37.74 per cent of the total respectively. Jhunjhunu, Jalore and Sikar districts accounted for a higher percentage of young stock ('heavy bottom' population) with a relatively higher share of cattle than buffaloes. Draught animals accounted for 28.49 per cent of the total bovine population in the state - about 39 per cent of cattle and 12.82 per cent of buffaloes. The total number of male cattle is three times that of male buffaloes. Male cattle are in dominance in the southern region of the state (Dungarpur, Banswara, Udaipur, Kota, Bundi and Jhunjhunu). The number of male buffaloes is also higher in the districts dominated by male cattle. The size and composition of milch animals underlines two facts, namely, increase in the number of male cattle is an indicator of agricultural backwardness, and buffaloes are found mostly in ghee production areas, while cattle are found in fodder deficit areas.

A more detailed analysis shows that the cattle are reared for supplying male offsprings and milk while buffaloes are maintained only for milk purpose. With the increased availability of agro products the population of male animals has declined more rapidly in the case of buffaloes than in cattle. This is because male buffaloes are considered inefficient for draught power. Moreover, the new technology of cattle breeding has contributed to a rapid breakthrough in milk production reducing the requirements of draught animal in agriculture. An inverse relationship between density of cattle and number of tractors has been observed. If male cattle are higher (and buffaloes are less in number) the number of tractors will be less and vice versa.

Feed and fodder availability is the critical aspect of milch animal management in the state. The present strength of milch livestock cannot be sustained with the available feed and fodder. To supplement the efforts of the State Government to encourage state feeding and cultivation of fodder, the animal husbandry schemes should necessarily include fodder cultivation wherever possible. The community grazing land should be leased to the dairy producers. Lastly, to tackle the problem of non-availability of good quality animals, calf rearing programme with bank assistance should be launched on a large scale.

Economics of Milk Marketing in Khurda District of Orissa

Niranjan Rout and Mrutunjaya Tripathy*

The paper attempts to identify the agencies involved and the channels through which milk is marketed in both the rural and urban areas and to study the marketing costs, margins and price spread in the marketing of milk among different size-classes of milkmen in Khurda district of Orissa. For this purpose, four marketing situations through which a major share of milk production of the locality is marketed have been identified in the selected study area of Bhubaneswar block in Khurda district. The marketing costs, margins and price spread in different marketing channels have been estimated using the mode method.

A large number of intermediaries are involved in the process of milk marketing as observed through the investigation and they form a long chain of market channel. The agencies involved in the process of milk marketing are the village traders, hotel managers,

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Orissa Milk Producers' Federation (OMFED) and mini traders. In the direct selling of milk, the milk producers receive about 93 per cent of the price paid by the consumers in the rural area. The price received by the producers cover the variable costs but it does not cover the total cost of production. In the marketing channel having one middleman also, the producers recovered the variable costs but could not recover the total cost of production. In the marketing channels having two middlemen, the producers received a marginal return over the variable costs, which varies from Rs. 0.89 to Rs. 0.99 per litre but failed to recover the total cost of production. In the marketing channel having three middlemen, the price received by the producers was to the extent of 50 per cent of the price paid by the consumers. The milkmen's share over variable cost was to the extent of Rs. 0.64 per litre. But the producers failed to get profit over total cost of production per litre. In the existing marketing scenario, the milkmen got a marginal profit over the variable costs but could not recover the total cost of production. In such cases, low cost technology may be developed to minimise the cost of production so that the dairy owners can get a remunerative price.

Efficiency of Different Marketing Channels for Goats in Etawah District of Uttar Pradesh

A.K. Dixit and B.D. Shukla†

The paper examines the efficiency of different marketing channels in the marketing of goats in one of the pioneer districts of Uttar Pradesh, namely, Etawah district. Forty pairs of sellers and buyers were randomly selected from each of the three markets out of 18 markets in the district. Information on 170 goats traded in these three markets was used for the analysis and the data pertained to the agricultural year 1992-93.

As many as ten marketing channels were identified in relation to goat transaction in the area of study. The main focus of this paper is therefore to identify the most efficient channel in terms of the producer's share, marketing cost and the marketing margins. The farmer - itinerant trader - wholesale trader was the most efficient channel, followed by farmer - itinerant trader - farmer, and farmer-cum-goat keeper - wholesale trader. The first seller's share in the buyer's rupee ranged from about 52 to 99 per cent in different markets. The marketing cost and market margins per goat were found to be the highest in the Ekdil market which is the smallest of the selected markets. In general, Jaswantnagar was the most efficient market and Ekdil the least efficient one. Further, these markets are found to be spatially integrated.

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Livestock Economy of Andhra Pradesh - A Disaggregate Analysis Over Time and Space

D.V.S. Rao and V.T. Raju*

The paper examines the pattern of changes in the composition and distribution of livestock in Andhra Pradesh over space and time with respect to species, sex and age groupwise and identifies the factors responsible for the observed trends during various inter-census periods from 1956 to 1993 (i.e., from 8th Livestock Quinquennial Census to 15th Livestock Census) in Andhra Pradesh. It is noted that the total cattle population showed a continuous decline whereas the total buffalo population increased by 53 per cent between 1956 to 1993. Between the male and female cattle, females decreased by 19 per cent and males increased by 8 per cent. Cattle young stock also decreased marginally. Among buffaloes, female buffaloes increased by 67 per cent and he-buffaloes decreased by 41 per cent during the same period. Young stock of buffaloes increased by 84 per cent. Telangana region accounted for 55 per cent of the total cattle, 56 per cent of males, 51 per cent of females and 55 per cent of young stock. Coastal Andhra region accounted for 52 per cent of total buffalo population, 50 per cent of young stock, 52 per cent of females and 63 per cent of males. Total buffalo population in all the regions showed an increase in all the inter-census periods except in 1966 to 1972, which was contributed by females and young stock. The decrease in cattle was accounted by all categories of cattle in Coastal Andhra and Rayalaseema and female cattle in Telangana. Forty-six per cent of sheep and 50 per cent of goat population was concentrated in Telangana. The number of goats increased by 17 per cent and that of sheep decreased marginally by 0.99 per cent from 1956 to 1993. The poultry population increased by 247 per cent and all the regions of the state reported large increases. Between 1977 and 1993 draught animal power decreased by 8.5 per cent from 66.38 lakhs to 60.70 lakhs and draught buffaloes decreased by 28 per cent and draught cattle by one per cent. The availability of pastures and other grazing land decreased by 36.26 per cent between 1955-56 to 1992-93 and fodder crops area increased by 12 per cent.

The changes in the livestock economy of the state was characterised by gradual decrease in patronisation of white cattle, decrease in grazing lands and pasture availability to cattle, export of cattle to neighbouring states for slaughter, epidemic outbreaks due to excessive rains and floods, adverse seasonal conditions during different periods, replacement of livestock due to the use of modern means of transport and negligible increase in the rural livestock units, veterinary hospitals, livestock supervisory units and artificial insemination centres.

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Livestock Structure - An Analysis of Trends and Factors Influencing Working Draught Animal Population in Bihar

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In this paper, an attempt has been made to examine the structure of livestock, growth rate of livestock and factors influencing the number of working draught animal population in Bihar. The study is based on secondary data collected from published sources and livestock census data from 1951-52 to 1982-83. Cobb-Douglas production function was fitted to districtwise data on cropping intensity, number of tractors and number of working draught animal population with a view to examining their relationships. Cattle population in Bihar accounted for about 46 per cent of the total livestock population in 1982-83, followed by goats, buffaloes and sheep. A declining trend was observed in the share of cattle population in the total livestock population in the state from about 57 per cent in 1951-52 to about 46 per cent in 1982-83, while an increasing trend was observed in the case of goats and buffaloes from 23.13 per cent to 34.33 per cent and from 12.82 per cent to 13.17 per cent respectively during the same period. Among bovines, the proportion of cattle and buffaloes was 78 and 22 per cent respectively. Of the total bovine population, female cattle and female buffaloes over 3 years of age constituted 21 and 11 per cent respectively. Further, a declining trend was observed in the share of female cattle in the total bovine population while there was an increasing trend in the case of female buffaloes during the period. The average annual growth rate of total livestock population was estimated to be 1.25 per cent during 1951-52 to 1982-83. The categorywise growth rate analysis showed that the growth rate was maximum in the case of goats (3.52 per cent per annum), followed by pigs (2 per cent) and buffaloes (1.4 per cent) and it was minimum (0.38 per cent per annum) in the case of cattle population during 1951-52 to 1982-83. The rate of growth of female cattle and female buffaloes over 3 years of age was also found to be positive (0.23 per cent and 1.36 per cent per annum respectively). The study showed that milch buffaloes are becoming more popular among farmers/milk producers.

The analysis of data relating to agricultural holdings, working draught animals and tractors showed that the number of tractors in the state increased by 955 per cent during 1960-61 to 1982-83 while the increase in the number of working draught animal population was marginal, being only 5 per cent during the same period. It was also noted that as the average size of holding decreased, the average number of working draught animal per holding declined. The results obtained from the production function analysis indicated that the number of working draught animal population in the state was affected by cropping intensity. The regression coefficient of cropping intensity was found to be negative and highly significant at 1 per cent probability level, indicating that the cropping intensity has contributed significantly to the reduction in the number of working draught animal population of the district. This may be due to more use of mechanical power in the agricultural

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operations. The value of the regression coefficient of the number of tractors was found to be positive and significant at 5 per cent level of probability which implies that the tractors have not contributed to the reduction in the number of working draught animal population in the district. This may be due to non-availability of tractors to a majority of the farmers at the time of operation which forced them to keep at least one or two draught animals. Besides, the tractor was purchased not only for agricultural operations but also for business purpose.

Power Scenario of a Punjab Village (A Case Study)

K.C. Dhawan and R.S. Prihar*

The paper attempts to analyse the availability of animal draft power in different farm holdings in the Punjab and the factors responsible for the observed trend in the availability of draught animals, and to examine the availability of draught power in different states of India. Banwalipur village was selected from central zone of Punjab where a high degree of mechanisation has taken place and consequently the use of animal draught power was affected adversely. Further, the farmers were classified into marginal, small, medium and large with a view to examining the use of animal draft power across farm size-groups. The data were collected by interviewing all the farmers of the village and pertained to the year 1990-91. Averages and percentages were worked out to analyse the data.

Theoretically, draft animals should be in the proportion of 50:50, whereas it was hardly 10 per cent of the total animal population of the village. Implicitly, the major operations (ploughing and irrigation) have been mechanised where animal draft power was mostly used. Secondly, lack of slaughter houses in the Punjab also contributed to the decline of animal male population in the state as it is not an economic proposition. The number of livestock kept by marginal, small, medium and large farmers was 9.7, 17.5, 33.2 and 12.8 per cent of the total respectively. Medium and small farmers could not afford tractors due to the small size of their holdings and large farmers, by and large, have mechanised their farms.

Power availability from human labour and draft animals was 11.3 and 8.2 kW respectively, whereas tractors, electric motors, and diesel engines supplied 426.7, 222.3 and 112 kW respectively. Draft animals hardly supplied about 1.05 per cent of the total power available in the village. More interestingly, human labour contributed 1.45 per cent of the total power available in the village. The declining trend in the animal draft power could be attributed to mechanisation of farm operations, especially seedbed preparation, irrigation coupled with the lack of slaughter houses due to religious sentiments though the cropped area has increased to about 7.52 million hectares in 1990-91 from 4.73 million hectares in

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1960-61 in the Punjab with cropping intensity of 183 per cent. Further, to keep draft animals on the farms is not an economic proposition as these animals compete with human beings for the use of scarce resources along with non-availability of adequate work on these farms. Thus the use of animal draft power has been affected drastically due to mechanisation of different farm operations. This trend is likely to continue in the near future.

The picture of animal draft power in different states, however, revealed that in Gujarat, Kerala, Madhya Pradesh and Punjab the number of draft animals declined in 1987 compared to 1972. But in Jammu and Kashmir, Uttar Pradesh and Himachal Pradesh, it increased to the double digit level. Implicitly, these states were least mechanised. In contrast, Tamil Nadu, West Bengal, Rajasthan, Orissa, Haryana, Bihar and Andhra Pradesh, however, showed a meagre increase in animal draft power. Thus the growth of draft animals is highly linked with the level of mechanisation of farm operations along with the population pressure as these animals compete for the use of scarce resources.

Economic Rationale of Adopting Dairy Farming as a Tool for Income and Employment Generation for the Weaker Sections: A Case Study in Pipili Block of Puri District, Orissa

H.N. Atibudhi†

The paper examines the economic rationale of adopting dairy farming as a tool for income generation and employment creation in Pipili block of Puri district in Orissa. For the purpose of the study, data were collected from a sample of 40 beneficiary households and an equal number of non-beneficiary households which were selected by using multi-stage random sampling technique. The sample consisted of 15 small farmers (1-2 ha), 15 marginal farmers (less than 1 ha) and 10 landless labourers each from the two categories of households. The data pertained to the year 1990-91.

The results of the study provided micro level evidences in support of using dairy enterprise as a measure tool for anti-poverty programmes. The additional productive employment generated through the activity of dairying among the beneficiaries was 166, 169 and 171 man-days for small and marginal farmers and the landless respectively, accounting for 43.45 to 53.27 per cent more labour employment, compared to the non-beneficiaries. The study further revealed that the adoption of dairy enterprise raised the income levels of the beneficiaries by Rs. 2,527, Rs. 2,606 and Rs. 2,210 for small and marginal farmers and the landless respectively, which were higher by 35 to 40 per cent than the non-beneficiary households. However, the benefits seemed to attract the upper castes rather than the tribals who did not respond well to the dairy schemes.

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Economics of Milk Production with Special Reference to Resource Use in the Existing Market Environment of Orissa

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The paper attempts to examine the structure of dairy farms, cost of production of milk and its market price and the factors involved and their relative contribution to the milk yield through suitable statistical tools. The data relating to the cost of production of milk were collected from a sample of 50 households, grouped under three size-classes according to the number of cows kept, selected from Bhubaneswar block in Khurda district of Orissa. The milk production environment in the state is primitive where local breeds are found to be concentrated to the extent of 67.64 per cent in size-class I (less than five cows per household) to 78.72 per cent in size-class II (between 6 and 9 cows per household) in the sample households. The number of dry cows was more (varying from 41 per cent to 44 per cent of the total) among different categories of cow owners. The number of exotic cows with high milching potentiality in the selected households varied from 21 per cent in size-class II to 32 per cent in size-class I. In such an environment it is essential to provide more number of exotic breeds to small and marginal farmers through a revolutionary process in the rural development programmes for augmenting milk yield in the state.

The feeds like concentrates and dry feeds play an important role in increasing the level of milk yield. As the concentrate is very expensive, the production of green feeds should be encouraged among the dairy owners. Since large areas are rainfed, green feeds cannot be grown in the *rabi* and summer seasons. Suitable dry feeds should be developed as an alternative to concentrates for *rabi* and summer season. As concentrates play a significant role in increasing the yield of milk, the technique for providing concentrate at lower cost in the rural areas should be a component in Research and Development (R and D). The use of prophylactic measures played an important role in increasing the milk yield.

It is also estimated that the cost of production of cow milk on Cost-A_1 basis worked out to Rs. 3.87, Rs. 5.20 and Rs. 3.24 per litre respectively in size-class I, size-class II and size-class III (more than 10 cows per houschold). Further, the total cost of production per litre of milk in the corresponding three size-classes of dairy farms was Rs. 6.39, Rs. 7.87 and Rs. 5.67.

Since in the existing marketing scenario, the milkmen got a marginal profit over the variable cost but did not recover the total cost of production (on Cost-C basis per litre), an attempt should be made to provide a dependable market support through creation of milk procuring/processing centres in the milk producing areas. In the areas where milkmen are concentrated, an agribusiness consortium among the milkmen may be formed, which will not only play an important role in supplying feeds to the members, but will be able to procure milk at a remunerative price. If the processing facilities are taken up at the consortium level, the processed milk even can be exported by the consortium and will create more demand for the product.

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Role of Livestock Enterprises in Stabilising Farm Income on Mid-Hill Vegetable Farms

A.K. Sharma and S.K. Sharma†

An attempt has been made in the paper to examine the existing cropping pattern and the impact of supplementary enterprises like dairy, poultry and rabbitry in increasing and stabilising farm income on vegetable farms in Himachal Pradesh. A two-stage sampling technique was used to select a sample of 150 vegetable farms with holding size less than one hectare each from two blocks of Kangra district. The data were selected through survey method and pertained to the agricultural years 1986-87 to 1991-92. The vegetable farmers grew cereals too on their farms for home consumption. The study revealed that there is a need to reallocate the existing farm resources. By optimising the existing resources and introducing supplementary enterprises under existing technology, the returns of vegetable farmers could be increased by 34 per cent (from Rs. 24,600 to Rs. 33,000). The introduction of dairy, poultry and rabbitry into the cropping system not only increased the returns but reduced the risk too by about 11 per cent. In risk efficient plans the units of crossbred cow, poultry and rabbitry showed continuous increase with an increase in the gross margins. However, a unit of local buffalo showed an increase in the initial two plans but then decreased in the final two plans (plans III and IV) showing that buffalo local is less profitable than the crossbred cow in the study area. Different risk efficient plans can be chosen by the farmers as per their income-risk criterion.

Economics of Poultry Farming in Indore District of Madhya Pradesh

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The study seeks to examine the economics of poultry farming in Indore district of Madhya Pradesh. Specifically, it examines the cost and returns per layer, the net returns, cost of production per egg and benefit-cost ratio on small, medium and large size-groups of poultry farms. The study is based on the number of layers in the different size-groups of poultry farms, classified into small, medium and large, using the cumulative cube root frequency method. A total of 16 poultry farms - 4 in small category, 7 in medium category and 5 in large category - was randomly selected for economic analysis. The data were collected by survey method during the agricultural year 1992-93.

The results of the study revealed that capital investment per layer, on an average, was estimated at Rs. 104.50 and it was Rs. 104, Rs. 110 and Rs. 100 on small, medium and large

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size poultry farms respectively. The total cost of maintenance per layer, on an average, worked out to be about Rs. 217. Feeding practices did not show any variation in these three size-groups of poultry farms. The general practice was to feed, on an average, 90 to 100 grams of feed depending on the age of the layers. On an average, feed cost accounted for the highest expenditure, being 57.47 per cent of the total cost of maintenance, followed by the cost of layers upto laying stage 23.48 per cent, depreciation 3.34 per cent, labour charges 2.74 per cent, electricity charges 0.92 per cent and the veterinary aid 0.88 per cent.

After deducting the returns from other than eggs, on an average, the net cost of maintenance per layer amounted to Rs. 176.43; it was higher on small size poultry farms than on the medium and large size poultry farms. The egg production, on an average, came to 277 eggs per layer, valued at Rs. 207.75. The net returns per layer amounted to Rs. 23.17, Rs. 30.52 and Rs. 39.63 on small, medium and large size poultry farms respectively, with an overall average of Rs. 31.32. An increasing trend was observed in the egg production and net returns on large size poultry farms. Better breeding, feeding and management on large size poultry farms resulted in higher egg production and returns per layer on these farms. On an average, the cost of production per egg worked out to Rs. 0.63 and it was the highest on small poultry farms due to lesser egg production per layer. The benefit-cost ratio, on an average, was to 1:1.18 and it was higher on large size poultry farms. Thus poultry farms of all categories were economically viable in the study area.

The findings of this study indicated that it is more profitable to follow crossbreeding programme for improving the potentiality of the layers. In the case of layers the selection of breeds of high egg producing strains suited for different agro-climatic regions and educating farmers on scientific management of superior poultry breeds and supplying them with good quality poultry feeds, medicines and chicks regularly at cheaper rates at their door steps will help to increase egg production. The poultry enterprise should be organised as an independent enterprise on commercial basis by providing capital and credit at subsidised rates and encouraging the establishment of more co-operative societies to provide production and marketing services to the poultry farms in rural areas of Madhya Pradesh.

Growth of Milk Production in Himachal Pradesh

S.K. Chauhan and Ravinder Sharma†

The paper examines the growth in milk production in Himachal Pradesh and estimates the demand and supply of milk to meet the nutritional requirements of the population in the state. Specieswise milk production data were collected from secondary sources, relating to the years 1977-78 to 1993-94. Over a period of 17 years, the cow, buffalo and goat milk production increased by 218, 92 and 131 per cent respectively. Buffaloes dominated the milk production scene contributing 51 per cent of the total whereas the share of cows and goats was 45 and 4 per cent respectively. The per caput daily milk availability was 336 grams, which was higher than the national average of 194 grams. Buffalo, cow and goat

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milk production increased significantly at the compound growth rate of 4.10, 7.51 and 5.55 per cent per annum respectively. Moreover, the growth rate of cow and buffalo milk production was higher than the national average of 7.29 and 3.72 per cent as well as the world average of 1.02 and 3.93 per cent per annum respectively, estimated by R.K. Patel (1993) for the period 1981-90. The milk production in the state increased significantly at the compound growth rate of 5.50 per cent against the national average of 5.76 per cent per annum. The average milk yield of cow was observed to be lower than that of the buffalo, but it increased at a faster rate (4.86 per cent) than that of the buffalo (1.54 per cent) mainly due to intensive cattle crossbreeding and dairy development programmes. The projected future milk supply (1,615.70 thousand tonnes) being higher than the nutritional requirement of 675.56 thousand tonnes by the year 2010 A.D. calls for a careful planning for its optimum utilisation.

Changing Composition and Role of Livestock in the Punjab Economy - An Inter-Size Analysis

Inder Sain and A.S. Joshi*

The paper examines the composition and role of livestock over time in the Punjab State. The analysis carried out relates to two points of time, i.e., 1979-80 as the base period and 1991-92 as the terminal period. The data used in the analysis have been culled from the vast data collected in the projects "An Income and Expenditure Pattern of Punjab Farmers" for 1979-80 and "Economics of Farming in Punjab" for 1991-92. The data obtained from a sample of 144 and 205 holdings were analysed which were well spread over different size categories of farms during the base as well as the terminal period of the study respectively. The study attempts to analyse the composition of draft versus milch cattle, growth pattern of investment and role of milch cattle in supplementing farm family income over time. The study revealed that significant structural shifts took place in the livestock wealth of the Punjab State. There was a sharp reduction in the number of draft cattle in the study area. Intensive mechanisation of the state agriculture replaced draft animals to the extent of three-fourths of its size in the base period. The highest replacement took place on smaller farms. The common availability of custom-hiring services of farm machinery in the rural areas made it feasible for them to get rid of the costly maintenance of draft cattle. Further, this replacement of draft cattle by the state peasantry encouraged them to make higher investment in milch cattle and particularly in cows which led to boost the milk production leading to the threshold of white revolution. This major shift towards milch cattle played a vital role in supplementing farm family income significantly in all the size categories of farms and particularly on smaller farms in the study area. Thus the overall implications of

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the analysis indicate favourable trend towards milch cattle paving the way for white revolution in the state. There is, thus, need to support the poor peasantry by ensuring better access to finance, on the one hand, and providing better stock of milch cattle, on the other, so that the dairying enterprise may flourish to the maximum extent.

Factors Influencing Milk Production: A Study in Khurda Block of Khurda District (Orissa)

J.P. Singh,† M.L. Chakraverty† and R.N. Das‡

The paper attempts to identify the factors influencing milk production in the sample villages of Khurda block of Khurda district in Orissa. The study is based on analysis of data collected from a sample of 61 households rearing cows and buffaloes in the area. The data pertained to the year 1993-94. Cobb-Douglas production function was fitted to the data.

The findings of the study clearly revealed the superiority of buffaloes over cows even under Orissa conditions where buffalo rearing is yet to gain momentum in respect of three important economic variables, i.e., feed cost, milk yield and milk prices. It was the inherent genetic potentiality of buffaloes, coupled with consumption and absorption of better quality feed that led to better quality milk production, which in turn, fetched higher prices (Rs. 8.39) per litre. It was the feed-milk conversion quality attributes of buffaloes that led to more milk yield. As such, the feed cost per litre of buffalo milk (Rs. 3.59) was lower than that of cow milk (Rs. 4.64). And accordingly, the feed cost per rupee of milk output was 42 paise in the case of the former and 60 paise in the case of the latter. A comparison of the relative advantage of buffaloes and cows among farm size-classes placed large farmers favourably in whose case the feed cost per rupee of milk output from buffalo units was less than 50 paise while in the case of cows it was more than 50 paise in other size-classes.

The results of production function analysis supported that at the aggregate level concentrates fed to wet cows and the number of wet cows in the herd had a positive significant impact on the milk yield of both cows and buffaloes while dry and green fodder had a negligible impact. A similar comparison of production function estimates made between farm size-classes showed that in the case of marginal and small farmers, the elasticity coefficients associated with dry and green fodder had the least impact on milk yield and were negative, indicating thereby excess use of these inputs than requirement. There is, therefore, large scope for enhancing milk yield by feeding more of concentrates to milch animals than feeding dry and green fodder alone.

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Unrealised Yield Potential and Determinants of Productivity of Different Farm Animals in Sub-Alpine Ranges of the Himalayas

Maya Kant Awasthi and S.K. Tewari*

This paper examines farm level yield gaps in different farm animals in the hill region of Uttar Pradesh, where agro-climatic conditions are not favourable for agriculture. The study is based on data collected from a sample of 60 tribal farm households and an equal number of non-tribal farm households from ten villages of Dharchula tehsil in Pithoragarh district of Uttar Pradesh. Three-stage random sampling technique was used for selecting the farm households. The sample included 30 marginal and 30 small farmers each from the tribal and non-tribal groups. The relevant primary data relating to inputs and output and farm household characteristics were collected on a pre-designed schedule through personal interview of the selected farm households for the agricultural year 1992-93. The animalwise farm level yield gaps were estimated between yields obtained by the best farmers of the area (considered as farm level potential yield) and by the average farmers of tribal and non-tribal groups of the area separately. These yield gaps were tested for their statistical significance using the "t" test statistic. For identifying the factors affecting yield and to estimate the magnitude of their effect, stepwise regression analysis was done for tribal and non-tribal groups of farms separately, instead of the conventional multiple regression analysis.

The results of the study indicated that the gap between the potential yield of the area and the actual yields obtained by the tribal farmers are statistically significant in milk and kids in goat, in milk and calves in dairy animal rearing and draft power services in draft animal rearing. Such gaps for non-tribal farmers were found to be statistically significant for only kids in goat rearing, in lambs and other returns in sheep rearing and in draft power services in draft animal rearing, and milk and calves in the case of dairy animal rearing. The differences in actual yield between tribal and non-tribal farms were found to be statistically significant for only milk and kids in goat.

Thus the results of the study suggest that there exists a wide unrealised yield potential of sheep and goats in sub-alpine ranges of the Himalayas on tribal as well as on non-tribal farms. Thus even with existing technology of sheep and goat rearing, farmers can be benefited just by tapping the existing unrealised animal production potential on both the categories of farms. Similarly stepwise regression results suggest that only three factors, i.e., dry fodder, concentrate and human labour are responsible for affecting productivity on both the categories of farms. The positive coefficients of these variables are indicative of the fact that sheep and goats in this region are not provided sufficient feed intake and care and that there is further scope of increasing economic return from sheep and goats by utilising additional amount of these inputs in the production sub-system of sheep and goat rearing.

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Structure and Constraints in Cattle Marketing in Haryana State

R.K. Grover, Himmat Singh and D.D. Gupta†

Marketing of cattle constitutes a big business for the farmers and animal dealers not only in Haryana State but also in other states including Punjab, Uttar Pradesh, Bihar and Rajasthan. Transactions worth crores of rupees are held annually in about 160 cattle fairs being held in different districts of the state yielding an income of above Rs. 90 lakhs per annum as revenue to the State Government. During the recent past, there has been an increasing recognition of the need for an efficient marketing system to sustain and accelerate the cattle production and to protect the interest of the producers. However, the knowledge of the structure, conduct and performance of cattle marketing is scanty and as such policy decisions are based on incomplete assessment of the existing situations. An attempt has been made in the paper to study the existing organisational and functional structure of cattle markets in Haryana. Difficulties faced by the cultivators and dealers have been highlighted and measures for improvement in the functioning of cattle fairs have also been suggested. Till 1969, cattle fairs in the state were being organised by Panchayat Samities/Zilla Parishads. In November 1970, the State Government took control over the fairs under Haryana Cattle Fair Act, 1970 (Haryana Act 30 of 1970). For the purpose of organising cattle fairs, the state has been divided into four circles, namely, Rohtak, Hisar, Rewari and Karnal and each circle is supervised by a Cattle Fair Officer who is assisted by one Cattle Fair Inspector, Accountant, Field Publicity Assistant and a Peon, all appointed by the State Government. In addition to it, Mela Chaudhary, registration certificate writers, change men, contractors, watermen, chowkidars and sweepers, brokers are hired either on commission basis or through contract system. Various functionaries involved in assembling and distribution of cattle included professional-producers and cultivator-producers, wholesale dealers, nomadic dealers and slaughter stock dealers. Problems encountered by the cultivators and dealers included charging of more than prescribed registration fees, operation of unlicensed brokers in the fair, harassment by the police officials on check posts, inadequate water facilities both for men and animals, lack of shelter in mela grounds, lack of medical facilities for men and animals. A large number of respondents also complained of high rate of registration charges (4 per cent of the sale price) and suggested that at least persons who purchase animals through some financing agency should not be charged any registration fee. Suggestions for making improvements in the functioning of cattle fairs encompass provision for exhibition of animals, co-operative stores in cattle fairs, creation of necessary amenities in the mela grounds, publicity of cattle fairs through head office to save advertisement cost and better location of mela grounds. Issue of export permits may be assigned to the Cattle Fair Officer who remains most of the time at the cattle fair site.

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Regional Spread of Draught Animal Power System in Gujarat

P.K. Singh†

India has 84 million draught animals making available 40 million horse power energy valued at Rs. 10,000 crores. Agro-climatic conditions in the country require a high input of motive power in critical farm operations. In spite of the role of draught animal power, this input has not been fully exploited. The present study was initiated to provide information on the magnitude, composition and density of draught animal stock in different size-groups of farmers and across regions of Gujarat. Factors affecting the spread of draught animals have also been identified. The study has made use of both primary and secondary data. Primary data collected under the I.C.A.R. project from the four principal regions of the state have been used. The secondary data were gathered from the Directorate of Economics and Statistics, Gujarat State and the Livestock Census Reports. The study revealed that between 1966 and 1988 the population of total livestock and buffaloes in the state increased but that of male cattle has stabilised. There were 30 lakh draught animals in the state, of which about 95 per cent were bullocks. The maximum number of draught animals were in Middle Gujarat, followed by Saurashtra, North Gujarat and South Gujarat. At the aggregate level, the density of draught animals per thousand hectares ranged from a low of 238 in Saurashtra and North Gujarat to 598 in Middle Gujarat. The density of bullocks was maximum in Middle Gujarat and higher in South Gujarat. Camels were predominant in North Gujarat and Saurashtra. Livestock ownership pattern revealed that the number of draught animals on farms increased with their size.

The annual availability of owned bullock power on small, medium and large farms was 239, 334 and 407 pair-days respectively. The per hectare density of bullocks in these three size-groups of farms was 0.77, 0.63 and 0.34 respectively. It indicated that small farms maintained more number of bullocks relative to their holding size. Among regions, the maximum density was found in Saurashtra. The level of utilisation of bullocks was only about 14.5 to 26 per cent of their availability. The study showed that considerable differences existed in the magnitude of draught animals across farms and between regions in the state. There is need to achieve a higher utilisation rate of draught animals through diversification programmes. The productivity of the animal draught power should be increased and priority should be given to popularise the available improved technology. There is also need to develop institutions like reliable markets for the hire-purchase of the services of work animals.

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Energetics and Economics of Milk Production in Two Selected Villages of Madhya Pradesh

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Under the purview of the All India Co-ordinated Research Project on Energy Requirements in Agricultural Sector, village energy audit studies have been commissioned in different states of India (representing different agro-climatic zones). The collected data are being analysed from different angles. Two villages, namely, Sonsa (sorghum-wheat zone, representing the Gird region) and Singod (rice-wheat zone, representing Kymore Plateau and Satpura Hills) were selected in 1990-91 and 1991-92 respectively. The village to village distance is 693 km. The energetics and economics of milk production under two different agro-climatic conditions of Madhya Pradesh are discussed in the paper. The study analyses the reasons for variations in energy needs for milk production in two different agro-climatic conditions in the state of Madhya Pradesh for different categories of farmers.

In terms of demographic information, the average family size was higher (7.7) in the Singod village than in Sonsa (5.8). The number of marginal farmers was significantly low in Singod as compared to Sonsa, whereas a reverse trend was noticed in respect of the number of large farmers. The number of livestock was significantly lower in Singod (475) as compared to Sonsa (2,915). The ratio of human to draft animal power was the highest (15.3) in Singod as compared to Sonsa (8.7). The available gross power in Sonsa (1.8 kW per hectare) was more than that in Singod (0.8 kW per hectare). The gross animal power utilisation was found to be the highest in Sonsa.

Milk production was significantly higher in Sonsa (5,155 litres/day) than in Singod (502 litres/day). On an average, milk production per milch animal was higher in Singod (2.86 litres/day) than in Sonsa (2.58 litres/day).

Categorywise annual energy input required for the production of milk was significantly higher in Sonsa (9,219.7 GJ - 10^9J=1 GJ) than in Singod (897.8 GJ). The availability of milk per capita per day was higher at 5.42 litres in Sonsa than in Singod (0.41 litre). The higher availability of milk per capita in the former village was due to the larger number of milch animals owned by the farm families. Dung production and consumption were also higher in the former village. The benefit-cost ratios for production of milk were significantly higher in Sonsa than in the Singod village. Livestock enterprises differ greatly in regard to capital turnover. The poultry enterprise has low initial investment and rapid turnover. In a normal period, poultry gives a complete turnover within a year. Milch cattle, on the other hand, calls for heavy initial capital investment and gives turnover in two to four years.

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Impact of Mechanisation on Draught Power Availability and Compositional Changes in Bovine Stock in Maharashtra: An Overview

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The paper analyses the trends in draught animal power and mechanical power availability along with the size and compositional changes in bovines in Maharashtra since 1956. The analysis of draught animal stock revealed a declining draught animal population only from 1966 to 1972 and from 1982 to 1987. More or less, it remained almost constant between the period 1961 and 1987 (with growth of only 0.03 per cent per annum). The growth of mechanisation of irrigation was observed to contribute significantly to the increase in the availability of draught power in agriculture. In the mid-fifties, of an estimated supply of draught power of about 2.6 million HP, pumpsets and oil engines accounted for only about 6 per cent. However, by the early seventies, the total horse power availability increased to 4.4 million units and the share of irrigation equipment increased to 39 per cent. Subsequently, during the late eighties, the share of irrigation equipment to total draught power availability increased to nearly 51 per cent. While the share of power through mechanised sources showed a rising trend in the last three decades, a declining trend was observed in the case of draught animal power. The share of animal power declined to 37 per cent by 1987 which was about 90 per cent in 1956. The study revealed that the mechanisation of irrigation has taken place at a much faster rate than mechanisation of tillage in the state. Thus the combined effect of mechanisation on displacement of work animals is likely to be low. Further, while the adult male bovine population remained stable over the period of three decades, the adult female bovine population has shown a significant growth. Consequently, the sex ratio of adult bovine has shifted rapidly in favour of females. Undoubtedly, the slowing down in the growth of work animals has facilitated the expansion of milch animal population which has grown by over 47 per cent between 1956 and 1987 compared to less than 15 per cent in the case of work animals. The cattle population was observed to be in the process of erosion and being replaced by buffaloes in the state.

The findings of this study have four major policy implications. Firstly, while draught animals are not displaced by other sources of farm power, there is a sharp increase in the stock of female bovine population. This trend is desirable in the light of the growing economic opportunity for increasing milk production and for undertaking dairying as a commercial proposition. Secondly, as buffalo population is increasing in proportion, the income generating capacity of milch animals will be higher because of higher productivity of buffaloes in terms of milk. Thirdly, since the use of animals for draught purpose is showing no significant growth, the farmers should resort to modern techniques of tilling as a substitute to animal power in the face of growing farming activities. Finally, the increasing use of mechanical equipments for cultivation in lieu of additional animal power will progressively

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increase the rural demand for energy, i.e., for electricity, diesel, etc. Therefore, there must be adequate investment in the power sector in future to accommodate this increasing rural demand for power.

Role of Credit in Promoting Growth of Livestock Enterprise

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An attempt has been made in this paper to study the role of credit in promoting growth of livestock enterprise in Madhya Pradesh. The specific objectives were to assess the quantum of credit availed, the extent of utilisation and its impact on different size-groups of farmers with respect to asset formation and income generation, to study the administration of the disbursement of credit and to suggest measures for improving it. For the purpose of the study, 50 respondents - 30 beneficiaries and 20 non-beneficiaries - were selected from Ashta block of Sehore district of Madhya Pradesh. The selection of the block and the district was made on the basis of largest quantum of credit disbursed. Of the selected beneficiaries, 15 were landless, another eight were having upto one hectare of land and the remaining 7 were small farmers (between 1-2 hectares). In the case of non-beneficiaries, 7 were landless labourers, four were marginal farmers and nine small farmers. The total area operated by the beneficiary and non-beneficiary farmers was about equal (12.7 hectares).

In the case of the animal husbandry programme, the total amount of loan and insurance admissible was respectively Rs. 5,200 and Rs. 550 for the purchase of a buffalo and Rs. 5,500 and Rs. 640 for the purchase of a cow. Out of the total amount of Rs. 1,79,130 disbursed to the beneficiary group, 41.73 per cent was disbursed among 13 beneficiaries who got a buffalo each and the rest of the amount (58.27 per cent) was disbursed among 17 beneficiaries who got a cow each. Subsidy accounted for 41.92 per cent of the total amount disbursed. The selected beneficiaries and non-beneficiaries derived income from agriculture, dairy, agricultural and non-agricultural labour and petty business and professions. Income from dairy for which loan and subsidy were provided equalled the output minus all cash and kind expenses incurred.

The milch animals purchased by the beneficiaries made a net addition to the assets already owned by them. The value per beneficiary was Rs. 5,971 and Rs. 14,027 per hectare. For the landless, marginal and small farmers this was quite substantial and significant. In most of the cases the milch animals were supplied by the Livestock Development Corporation of the Government of Madhya Pradesh. In other cases it was the purchase committee which procured the milch animals in the open market. In a very few cases the participants purchased milch animals of their choice, which have to be ultimately certified by the concerned Veterinary Extension Officer. Thus the chances of the loan amount being misutilised were very little. The financial aspect of the utilisation of the loan showed that the beneficiaries earned a total net profit of Rs. 24,530 or Rs. 818 per beneficiary participant. The income from the newly established dairy business contributed to the extent of 7.94 per cent of the total income.

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All the same, the objective of encouraging the farmers to take up dairy business was not achieved with the supply of milch animal through bank loan and subsidy. The beneficiaries faced the problems of grazing of animals and purchase of fodder and feed and deterioration in the quality of the animals purchased after some time. The participants also expressed their grievances against government and bank officials at different levels. The need is suggested for effective co-ordination of work of the personnel at different levels/departments to make the animal husbandry programme a success.

Milk Production in India and Its Component

A.K. Giri and Debdulal Banik*

An attempt is made in this paper to assess the position of milk production in India and across the country and to examine the effect of size, species composition and breed composition on milk production. The reference period of the study was from 1972 to 1982 which includes three quinquennial livestock censuses (1972, 1977 and 1982) and coincides with the period of implementing Operation Flood I. During this period, milk production in India increased by 43 per cent due to increase in the number of both milch cattle and milch buffalo stock by 5 per cent each. There was a gradual shift in favour of buffalo as milch animal because of its superiority in terms of milk yield, lactating efficiency, quality of milk and milk producing capacity out of ordinary feedstuff. The data of the three livestock censuses highlighted the fact that the buffaloes produced a larger number of female calves in their lifetime compared to the cows, which may be one of the causes for the shift in favour of buffaloes.

As a larger contributor in milk production, Uttar Pradesh comes first, followed by Punjab, Rajasthan, Gujarat, Tamil Nadu, Madhya Pradesh, Andhra Pradesh, Haryana, etc. Regionally, the Northern region occupied the first position, followed by the Western, Southern and Eastern regions. In terms of average milk yield per milch animal per annum, Punjab and Haryana were always ahead of other states. An average milk yield of above 1,000 kg annually per milch animal could be obtained in Punjab and Haryana even in the early years of the seventies. Rajasthan, Gujarat and Kerala could attain such a level only from the early eighties. In Punjab, Haryana, Kerala, Rajasthan and Gujarat the milk yield was found to increase continuously at an increasing rate.

The states with a relatively larger proportion of milch buffalo than the milch cattle were Punjab, Haryana, Andhra Pradesh, Gujarat and Uttar Pradesh. The states with major dependence on milch cattle, on the other hand, were Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu, Rajasthan, Karnataka, Himachal Pradesh, Jammu and Kashmir, Bihar, Assam, Orissa, Tripura and West Bengal. Among the states which occupied the first five positions in milk yield rate, Punjab, Haryana and Gujarat were seen to depend more on milch buffalo than on milch cattle and the two other states, Kerala and Rajasthan, on the other hand,

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depended more on milch cattle than on milch buffalo, and in the case of Kerala this dependence was overwhelming (90 per cent). Mere presence of a large number of buffaloes cannot just ensure satisfactory milk production unless they are properly maintained and fed. Regarding breed composition, the higher milk yield per milch cattle in Kerala could be explained by the large number of crossbred cows which constituted nearly 50 per cent of the milch cattle in 1982. In no other state the impact of crossbred cows could be felt significantly because of their small presence in total milch cattle.

A Comparative Analysis of Livestock Wealth in India and Pakistan

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India and Pakistan are the nations with similar agro-climatic conditions, each endowed with rich flora and fauna. In Indo-Pak basin livestock rearing continues to be a vital avenue for employment and income generation specially in the rural areas. In spite of many similarities between the two countries, the productivity trends in the various species of domesticated animals show marked differences. Pakistan has higher density of farm animals, better growth of ruminant population, significantly higher milk and meat yielding animals, favourable sex ratio for adult females and the best per capita milk availability in the SAARC (South Asian Association for Regional Co-operation) region. However, it is stranded with obsolete milk processing technology, urban cattle colonies and the 'middleman' is the major benefactor in the sale of milk. On the other hand, India has indigent parameters of livestock development and production. It has lesser pasture land available per animal, draws lesser draft power from its bovines and had recorded negative trend in cattle population in the last decade. Though India has been successful in establishing dairy co-operatives as also augmenting its research, training, scientific and technical manpower resources to an appreciable extent, milk production potential as well as carrying capacity of land is relatively poorer when compared with Pakistan. While in India milk production is contributed in equal proportion by cattle and buffaloes, in Pakistan buffaloes account for three-fourths of the total production. Difference also exists between the neighbouring countries in the composition and distribution of various herd sizes of milch animals. The paper is a modest attempt to highlight significant incongruities in the livestock traits between the two countries and discuss the possible reasons for the variance in the livestock wealth of the two countries. The study stresses the need for culling less productive/unproductive animals, genetic upgradation, adequate veterinary care and making more pasture lands available for the Indian livestock.

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Growth Trend of Jamunapari Goats in relation to Changing Ecological and Socio-Economic Characteristics in Its Home Tract of District Etawah, Uttar Pradesh

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Jamunapari goats in their home tract of Chakarnagar (Etawah) are slowly getting extinct which has resulted in the vanishing of this germplasm which was known for higher milk yield. The interest of the people in the area in rearing Jamunapari goats is also declining. This study, undertaken in Chakarnagar block of district Etawah in Uttar Pradesh, examines the growth trends of Jamunapari goats in relation to changing ecological characteristics and works out the economics of milk production. It is based on an intensive enquiry of five villages selected purposively from Chakarnagar (Etawah). The data were collected for three points of time, i.e., 1960-61, 1970-71 and 1993-94.

The number of Jamunapari goats on the sample households has decreased sharply during 1970-71 and 1993-94 over 1960-61 on all categories of households. As against this situation, the number of stall-fed local goats increased during the same period. The decrease in the number of Jamunapari goats was associated with non-availability of fodder and concentrates, on the one hand, and non-availability of pasturemen and increased demand for meat from the local residents, on the other. The net maintenance cost of a Jamunapari goat per lactation worked out to Rs. 80.68, Rs. 273.01 and Rs. 924.21 for the respective years. It was remarkable to note that no extra fodder was required in 1960-61 to maintain the Jamunapari goat due to sufficient availability of fodder in the forest. It was also observed that the percentage cost of concentrates has gone down during the later years. The average milk yield per lactation and input-output ratio have also gone down during the later years because of non-availability of fodder and concentrates. It may thus be concluded that there has been a sharp decline in the population of Jamunapari goats with the changes in ecological and socio-economic conditions related to availability of feed and fodder in the area. This has posed a serious problem of depletion of this germplasm - a high yielding goat of India. It requires a serious correction measure to save this high milk yielding germplasm.

Resource Use Efficiency and Output Performance of Dairy Loan Beneficiary and Non-Beneficiary Farmers under Integrated Rural Development Programme in Jorhat District of Assam

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An attempt has been made in this paper to investigate the resource use efficiency and output performance of dairy loan beneficiary and non-beneficiary farmers under the

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Integrated Rural Development Programme (IRDP) in Jorhat district of Assam. The study is based on analysis of data obtained from 40 non-beneficiaries and 80 beneficiaries of IRDP availing dairy loan from eight rural and commercial bank branches in the area. The necessary information was collected during 1990-91 using multi-stage random sampling technique. The results of the study revealed that the beneficiary farmers were not satisfied with the stock of milch animals supplied to them owing to their poor milk yielding capacity, defective health condition, higher maintenance cost, etc.

In the utilisation of existing resources such as green fodder, dry fodder, concentrate feed, human labour, working capital, etc., the beneficiary farms differed significantly from the non-beneficiary farms. A positive correlation was observed between the size of holding and the amount of dairy loan diversion, the highest being 45.65 per cent in the case of crossbred cow and the lowest being 41.84 per cent for local cow. The beneficiary farmers reported higher animal sale and animal death with respect to she-buffaloes and crossbred cows.

The output performance of the non-beneficiary farms also differed considerably from the beneficiary farms. The annual milk yield of a particular breed of milch animal varied between the same size-group of beneficiary and non-beneficiary farms. The cost of production of milk per litre of local and crossbred cow on non-beneficiary farms was respectively 53 and 12.45 per cent higher than on the beneficiary farms. The non-beneficiary dairy farmers incurred comparatively higher maintenance cost per milch animal than the beneficiary farmers in the expectation of higher returns. However, different ratios on returns to capital, farm business income to capital, returns to family labour and management to capital were better on the beneficiary farms than on the non-beneficiary farms.

There was considerable difference in resource utilisation and income generation in different units of milch animals between the beneficiary and non-beneficiary dairy farms. In spite of the defects in the selection and procurement of milch animals and diversion of loan amount, considerable change in regard to additional labour days used and incremental income was evident in all the size-groups of beneficiary farmers under the IRDP. However, the overall performance of the beneficiary dairy farmers was not at par with the non-beneficiary farmers possibly due to lower productivity of milch animals, shortage of working capital, lack of professional interest, etc. Thus there is scope for bringing the small farmers at par with the non-beneficiary dairy farmers through supply of quality milch animals, provision of adequate working capital, imparting appropriate training, etc. Adequate supervision and monitoring would also reduce the extent of loan diversion by the beneficiary farmers.

Changing Composition of Cattle and Buffalo Population in Punjab: An Inter-Regional Analysis

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An attempt has been made in the paper to study the changes in the cattle and buffalo population and the changes in male cow and buffalo population across the different zones

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of Punjab. The study is based on analysis of data obtained from the *Statistical Abstracts of Punjab* for the years 1980 and 1991. The data pertained to the years 1972 and 1990. Averages and percentages were used to derive the inferences. The study revealed that the total animal population (cattle and buffaloes) increased by 18.76 per cent in the state in 1990 compared to 1972. Across the zones, zone II recorded the maximum increase and zone III the minimum. All the districts except Hoshiarpur and Kapurthala reported increases in bovine population from 5.18 to 49.61 per cent. Out of the total animal population, the proportion of cow population declined from 50.17 to 33.67 per cent and that of buffalo population increased from 49.33 to 66.32 per cent. Similar trends were observed in respect of zones and districts. The population of cows declined from 52.99 to 36.90 per cent, from 45.16 to 31.24 per cent and from 46.67 to 35.66 per cent in zones I, II and III respectively between 1972 and 1990 with a proportionate increase in the number of buffaloes in these three zones during the same period. The main reasons for the decline of cattle population were that the crossbred animals could not fit into the climate of the state. Secondly, they required utmost care. Thirdly, people did not like cow's milk in the state due to low fat content. Finally, the cows required green fodder whereas buffaloes could be fed on roughages. While the total buffalo population in the state increased, the population of he-buffaloes decreased by 44.94. For the zones the decline ranged from 38.87 to 55.95 per cent. Across the districts Roop Nagar and Kapurthala reported the minimum and the maximum decrease respectively. Male cow population (above three years) declined by 48.39 per cent in the state. The decline in male cattle ranged between 41 and 57 per cent in the zones and between 36 and 75 per cent in the districts. The reason for the decline of draft animal power in the state was the widespread use of mechanical power in terms of tubewells, tractors, threshers and combines.

Determinants of Milk Production in Chitrakoot: A Case Study

Ravikesh Srivastava and S.K. Lal†

Milk production is a complex process and can be conceived as a function of several variables. There are a number of factors affecting milk production, i.e., feeds, breeding, management, age at first calving, season of calving, service period, advancement of lactation, number of lactation, dry period after the previous lactation, frequency of milking, age of the animal and body weight, etc. They all have considerable impact on the milk productivity. Thus an attempt has been made in this paper to identify the determinants of milk production in Chitrakoot in Satna district of Madhya Pradesh.

For the purpose of the study, data were obtained from a dairy unit having 127 crossbred cows, which maintained a complete record of daily milk production along with feeds and fodder fed to each animal. Information regarding other factors such as age of animals, length of lactation, number of lactation and feeding cost was also collected. The Cobb-Douglas production function has been estimated by ordinary least squares method for different explanatory variables. The study revealed that the crossbred animals for fodder-based milk

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production are not suitable in Chitrakoot. Balanced ration is necessary to exploit their genetic potentials. The high costs of feed, concentrates and labour are found to be the limiting factors in milk production, specially through crossbred animals. The number of lactations, the length of lactation and feeding cost are the major determinants of milk production in Chitrakoot.

Role of Dairying as a Specialised Enterprise in Poverty Alleviation of the Landless and Marginal Farmers of Rural Azamgarh in East Uttar Pradesh

Rajendra Singh*

The paper makes an attempt to examine the production, consumption and marketed surplus of milk and to find out the generation of additional employment and income through dairy enterprise for alleviation of poverty among the landless and marginal farmers in Azamgarh district of Eastern Uttar Pradesh. A sample of 40 dairy beneficiaries of the Integrated Rural Development Programme in the district, consisting of 29 landless labourers and 11 marginal farmers scattered in 40 villages of Koelsa development block were selected through random sampling method. The data pertained to the years 1988 to 1990. The results of the study revealed that the production of milk was the lowest in 1989 in both the categories due to the lengthy dry period. The consumption of milk showed an increase with the increase in the production of milk. The per capita consumption of milk per day was lower than the national average of 162 grams. It was higher in the case of marginal farmers due to the smaller size of the family compared to the landless labourers. The marketed surplus of milk was higher for the marginal farmers (53.57 per cent) than that for the landless labourers (52.44 per cent of the total milk production). The generation of employment through dairy enterprise was higher for the landless labourers compared to the marginal farmers. Consequently, the family labour income per household was considerably higher for the landless labourers. On the whole, the income from dairy was higher being 52.8 per cent of the total income in the case of marginal farmers against 50 per cent for the landless labourers. Thus positive generation of income from dairy enterprise in both the categories of beneficiaries indicates the important role the dairy enterprise plays in the alleviation of poverty among weaker sections of the society.

Structural Transformation and Role of Livestock in the Punjab Economy - An Inter-Regional Analysis

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The study examines the structural transformation and the role of livestock in the economy of the Punjab State at two points of time, 1979-80 (base period) and 1991-92 (terminal

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period). The data used in the analysis have been obtained from the projects: "An Income and Expenditure Pattern of Punjab Farmers" for 1979-80 and "Economics of Farming in Punjab", for 1991-92. The data were analysed for 144 and 205 holdings which were well spread over different zones of Punjab in the base year and terminal year of the study respectively. The study examines the changing composition of draft versus milch cattle, the growth pattern of investment and the role of milch cattle in supplementing farm family income over time. The results revealed significant structural shift in the composition of livestock in the Punjab State. A discernible feature was a sharpest reduction in the number of draft cattle in the study area. Intensive mechanisation of the state agriculture resulted in replacing draft animals to the extent of three-fourths of its size in the base period. The highest reduction of draft animal was recorded in central zone (zone II). The common availability of custom-hiring services of farm machinery in the rural areas made it feasible for them to get rid of the costly maintenance of draft animal. Further, this replacement of draft cattle by the state peasantry encouraged them to make higher investment in milch cattle particularly in cows which led to augment the milk production. This major shift towards milch cattle played a vital role in supplementing farm family income significantly over all the zones particularly in the central zone. Thus there is a need to strengthen the infrastructural facilities in the zones which lagged behind and to make the dairying enterprise in the state profitable.

Distribution of Milch Animals and Role of Dairying as an Adjunct to Crop Husbandry

S.S. Chahal and Randhir Singh*

The paper examines the distribution of milch animals among different categories of dairy farmers and the role of dairying as an adjunct to crop husbandry in the Punjab. The study is based on data collected from a sample of 261 dairy farmers selected from three districts, Ludhiana, Faridkot and Hoshiarpur representing the three agro-climatic zones of the state. The data pertained to the year 1989-90. The findings of the investigation brought out that the consumption of milk and the level of production of milk per household are related directly to the socio-economic development of the area. The density of milch animal population indicated that the stocking rate was higher per 100 hectares of cultivated area in zone I as compared to zones II and III. The cattle population was higher per 100 hectares of cultivated area in zone III than in zones I and II. The ratio of cattle to buffaloes turned out to be higher in the case of zone I, followed by zones II and III respectively. The results revealed that the herd size increases with the increase in land holding, due to better economic position and availability of feed and fodder which comes from the crop residue. The income from dairying was higher in the case of landless category of milk producers in zone III than in zones I and II. However, it decreased with the increase in the size of land holding in zones I and II as compared to zone III. An inter-category analysis reveals that the contribution of dairying to the total income increases with a decrease in farm size. The results indicate that dairying

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reduces the variability in income if introduced as a supplementary enterprise to crop husbandry. The implication of this study is that there is a need to formulate an appropriate policy to increase the ratio of cattle to buffaloes in total bovine population as cattle (crossbred) are high yielding. This will help to reduce the pressure on squeezing the land frontier and at the same time will go a long way to augment the milk production. Hence, dairying as supplementary to crop husbandry helps in reducing income variability, and the Government may encourage the farmers especially the marginal and small ones by providing incentives for taking up dairying as an enterprise.

An Economic Profile of Dairying in Rural Punjab - A Case Study

D.K. Grover and S.K. Mehta†

A study was initiated to examine the various aspects of dairying and related characteristics on the sample farms in the Punjab, where it was undertaken in small units along with the main agricultural activity. The paper attempts to highlight the general characteristics of the sample farms with reference to milch cattle and milk production in the study area, to work out the maintenance cost per annum per buffalo/cow, to analyse the average cost of production per litre of milk for buffalo/cow based on different cost concepts, to work out the bulkline cost of milk production per litre and the returns per buffalo/cow per annum on farms of various holding sizes. The study is based on data collected from a sample of 400 holdings, classified into five size-groups, selected from 20 villages in Bathinda district of Punjab. The data were taken from the "Farm Management Studies in Bathinda District of Punjab" conducted for the years 1987-88, 1988-89 and 1989-90 and the enquiry was done through survey method.

The study highlighted that most of the farms possessed two to three buffaloes and did not own any cow or possessed only one cow. The majority of the milch cattle belonged to the age group of five to nine years and about two-fifth of the milch animals were found to be dry at the given point of time. The average annual milk yield of a buffalo and a cow was estimated at 1,280 litres and 926 litres respectively. Only about 24 per cent of the sample farms sold milk which was just about 12 per cent of the total volume of milk produced on these farms.

The average annual net maintenance cost of a buffalo and a cow for the triennium ending 1989-90 worked out at Rs. 5,651 and Rs. 4,852 respectively. The average cost of milk production per litre in the case of buffalo based on different cost concepts, i.e., Cost A, Cost B and Cost C was estimated at Rs. 3.66, Rs. 4.19 and Rs. 4.53 respectively. The corresponding figures for cows were Rs. 4.40, Rs. 4.97 and Rs. 5.36. The bulk-line costs of production per litre of buffalo's milk covering 85 per cent of milk produced, of holdings and of buffaloes were Rs. 6.32, Rs. 6.73 and Rs. 6.80 respectively. The corresponding figures in the case of cows were Rs. 7.60, Rs. 9.08 and Rs. 9.18 per litre respectively.

The cost-benefit analysis revealed that rearing of milch cattle on the sample farms was not a profitable venture based on total cost (Cost C_2). Based on Cost C_2, the overall average net loss per cattle per annum turned out to Rs. 630 and Rs. 1,810 in the case of buffalo and

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cow respectively. The returns based on Cost A (which did not cover the cost components like interest on the value of milch cattle and cattle sheds and imputed value of family upkeep labour), i.e., business income could turn out to be a little positive and that too in the case of buffaloes only, whereas in the case of cows, even the business income per cattle per annum was found to be negative.

The main reason for this dismal picture was that the farmers in the study areas maintained milch cattle more for meeting the domestic consumption of milk rather than for profitable marketing. Another reason which may partly explain this phenomenon was that the value of family labour utilised for upkeeping milch cattle was imputed perhaps at a higher rate than their opportunity cost. As the milk yield per milch cattle particularly that of cows is very low, there is enough scope to take up popularisation of suitable crossbreeding programmes by the state and for development of more nutritive but economic feeding packages to increase the milk yield per milch cattle.

Constraints of Dairy Enterprise

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An attempt has been made in the paper to find out the constraints in dairy enterprise. Three-stage stratified random sampling technique was employed to select a sample of 72 farmers, 12 from each selected village covering the area of sub-montane zone of western Maharashtra. The data were collected with the help of specially designed questionnaire and pertained to the year 1989-90. The results of the study indicated that the weak financial status, cost factor and management difficulties were the main constraints in not maintaining good quality animals on the farms. The respondent farm families strongly expressed the dire need for finance for the purchase of milch animals and also for feed and fodder. They opined that good quality feed and fodder should be made available to them at reasonable rates and that they need to be assured reasonable and stable prices for milk throughout the year to make the dairy enterprise as a supplementary and paying proposition.

Relative Economics of Crossbred Milch Stock in Raipur District of Chhattisgarh Region in Madhya Pradesh

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To seek an answer to the question why cost of production per unit of milk of a milch stock is high in Chhattisgarh areas of Madhya Pradesh, a survey was undertaken in six

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selected villages of two major milk producing blocks of Raipur district. The study examines the operating cost and returns in different size-groups of farms and crossbreed, disposal and price of milk at different locations, utilisation of family and hired labour in different activities of dairy and constraints of milk production and marketing in rural areas.

The analysis of data collected from the 40 selected respondents reveals that small farmers have obtained better employment opportunities and more returns by adopting dairy as a specialised enterprise. A combination of crossbred and local she-buffaloes have produced more returns on the medium and large size farms. In specialised dairy enterprise farms a combination of crossbreed of milch stock like Murrah and Jersey or Murrah and Sahiwal has been proved more profitable. Local cow breeds are not economical in terms of milk production. Sahiwal performed better on large size farms due to low cost and it is easy to manage this crossbreed. In the environmental condition of Chhattisgarh region local she-buffalo combined with either crossbred cow or Murrah yields more net returns under specialised dairy enterprise farming with better management. Most of the production of milk is disposed to hotel/motel under different locations of dairy and the dairymen nearer to the city supplied relatively a larger percentage of milk production directly to household consumers at better price. Dairy farms located at a long distance from the city sold milk to middlemen at minimum price to save on cost of transportation which is uneconomical. More hours of labour use is associated with more numbers of stock on small farms, resulting in inefficient management of labour, especially family labour. Specialised dairy farms have used both family and hired labour efficiently. Forty-five per cent of the total labour use is used in feeding and milking activity and 20 per cent each in grazing and transportation activity. The major constraints in the production and marketing of milk are inferior breed, poor feeding practices, inadequate and unhygienic drinking water, insufficient veterinary facilities and lack of technical know-how and inadequate financing and marketing facilities. A strategy has to be developed for dairy enterprise farming in collaboration with various related departments of the State Government, non-governmental organisations and Agricultural University to enhance employment and income of the rural weaker backward sections and small farmers in Chhattisgarh region of Madhya Pradesh.

Relative Growth in Draught and Milch Stock in Chhattisgarh Region of Madhya Pradesh: A Districtwise Analysis

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The paper attempts to examine the relative growth in draught and milch stocks during three time periods, triennium 1980-82, 1985-87 and 1990-92 in Chhattisgarh region of Madhya Pradesh. Analysis of secondary data of livestock statistics over the period at district level reveals relatively more growth in the number of bullocks in the tribal districts compared to the non-tribal districts between the triennium ending 1982 and 1992. Mechanisation in agriculture on a large scale is taking place in the non-tribal areas. Male buffaloes are mostly

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used in performing various crop operations in the tribal areas and in order to increase their efficiency suitable he-buffalo drawn equipments have to be developed. The proportion of he-buffaloes in total draught stock in Chhattisgarh region is more than the state average. The growth in the number of she-buffaloes in the non-tribal districts has, however, little impact on dairy enterprise. Increasing demand for milk in urban industrial areas of non-tribal districts has not been fulfilled, which leads to higher prices of milk and milk products. Negative change in the growth of she-buffaloes in the tribal districts has resulted in a decline in the per capita availability of milk. In general a higher proportion of cows to she-buffaloes in Chhattisgarh region as compared to the state average proportion reflects relatively low milk production associated with low cropping intensity. In order to increase milk production in Chhattisgarh region, more investment in good breed of she-buffaloes is needed in sub-urban areas of the non-tribal districts along with better feed and management practices. A strategy to develop livestock industry has to be formulated for the sub-urban areas in co-ordination with Department of Animal Husbandry and Veterinary, Department of Agriculture, financial institution and Dugda Mahasang in the non-tribal as well as tribal districts. This strategy will enhance the economy of rural backward/poorer sections including small farmers and will also expand labour employment opportunities.

Role of Small Ruminants with Special Reference to Drought-Prone Areas

Syed Ajmal Pasha†

Small ruminants play an important role in the economy of rural households. The focus of this paper is on the role of small ruminants particularly in semi-arid or drought-prone areas of Karnataka, which are maintained largely on common property resources. It is based on the analysis of both secondary and primary data. Numerically, cattle dominate livestock; small ruminants formed about 38 per cent of the total ruminant livestock in Karnataka during 1989-90. Sheep population has increased by only 15 per cent between 1956 to 1989-90, whereas goat population has increased more than cattle, buffaloes and sheep in the state and the increase was 50 per cent during the same period.

The share of sheep and goats to total ruminant livestock is higher in the drought-prone districts than in the non-drought-prone and mixed type of districts. Large ruminants, on the other hand, dominate in the non-drought-prone districts. Paradoxically, the proportion of net sown area is higher in drought-prone districts than in the non-drought-prone districts. Forests, culturable and unculturable wastes, permanent pastures and other grazing lands are relatively more in the non-drought-prone districts than in the drought-prone districts. This indicates that though sheep and goats are playing a very important role in the drought-prone districts, the fodder base for these animals is much less and continuously shrinking.

Small ruminants contribute substantially to the total gross returns of rural households. Though sheep and goats are not a major source of income in the economy of rich peasants, more than 12 per cent of their total gross returns come from these animals, while the poor

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peasants and landless households derived respectively more than 17 per cent and 24 per cent of their gross returns from small ruminants. Further, the share of small ruminants is much larger in terms of net returns in the economy of household across all classes. A major problem affecting small ruminants is that lands which are a source of fodder for them are declining in quantity as also in quality. The quality of small ruminants in terms of productivity is also fast declining.

Livestock Growth in Scarcity Zone of Maharashtra

P.M. Kapase and J.D. Patil*

An attempt has been made in the paper to review the progress of livestock development by estimating the growth of livestock and poultry birds in Ahmednagar and Solapur districts of Scarcity Zone of Maharashtra and in the state as a whole during the period 1978-87. The livestock and poultry population has increased during the period of the decade in the scarcity zone area and also in the state. The farmers have replaced the uneconomic animals with economically viable animals and also changed their attitude of worshipping cattle as a part of religious culture. In spite of the growth in livestock and poultry birds as well as in related activities, the desired success in creating employment and enriching the rural economy could not be attained due to lack of adequate processing and marketing infrastructure, lack of stable and viable technology in feeding and livestock management, and a few other constraints. The development of adequate processing and marketing infrastructure and economically viable and stable technology would help to create more employment opportunities to the rural poor in the scarcity zone in particular and in the state in general.

An Economic Analysis of Livestock Composition in Madurai District, Tamil Nadu

S. Elangovan, T. Alagumani and R. Rajeswaran†

The recent technological changes in Indian agriculture have tended to replace draught animals and the animal population as a whole is declining. This study aims at analysing the changing composition of livestock in Madurai district of Tamil Nadu, identifies the reasons for these changes and suggests remedial measures. Compound growth rates were worked out for different livestock population. The analysis revealed that the total livestock in the state has registered a meagre 0.19 per cent growth per quinquennium between the period 1950-51 and 1988-89. The growth rate of bullock population has declined by 0.92 per cent, and that of sheep by 0.99 per cent. As expected, cows showed a 2.76 per cent growth and she-buffaloes has registered the highest growth rate of 9.70 per cent per quinquennium

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among all the categories of animals. At all geographical levels three facts are consistent: (a) Bullocks are declining in number. (b) Cows are increasing in number. (c) Buffaloes are also increasing except in wet lands at the micro level. The changes are mainly attributed to the cropping pattern, farming situation, cost effectiveness in maintenance and economic and social conditions of the people.

Economics of Dairy Enterprise with Crossbred Cows: A Case Study of Marginal Farmers of Ranjani Village (Pune)

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Ranjani village of Ambegaon tehsil, Pune district, located at about 60 km away from Pune on Pune-Nasik highway, was purposively selected for this study. The annual rainfall is about 2,000 to 3,000 mm and the sample dairy farmers have irrigation facilities. The milk co-operative, namely, 'Sri Narsinha Dudh Vyavasayik Sahakari Sanstha Maryadit, Ranjani' was registered in February 1978. The dairy co-operative has a total membership of 275 in 1994-95. For the purpose of this study, 20 marginal farmers out of 50 cultivating upto one hectare were selected. The selected marginal farmers possessed 34 crossbred cows, 28 crossbred female calves and 12 bullocks in the reference year 1994-95. The paper examines the economics of dairy enterprise in the selected village.

Thirty per cent of the marginal farmers in the sample possessed upto 0.4 ha of land each and the remaining had between 0.4 to 1.00 ha each, most of which was irrigated land. Dairying was reported as subsidiary occupation by 80 per cent of the sample dairy farmers. On an average, two persons per family worked in the dairy enterprise. The average number of days they worked in dairying was 70 and 90 in the case of male and female adults respectively during the year. The average expenditure on green and dry fodder and concentrates per crossbred cow came to Rs. 4,437 and Rs. 1,215 respectively during the reference year. The dairy farmers received on an average about 11 cart-loads of dung in a year. About 82 per cent of the manure was used on their own farms and the rest was sold. During the reference year 92 per cent of milk production was sold, 3 per cent was consumed at home and the remaining 5 per cent was fed to calves.

The total net income earned by the dairy farmers during the reference year came to Rs. 1,63,015 or Rs. 8,151 per dairy farmer or about Rs. 679 per month. Further, if imputed wages of family labour are also excluded from the total expenditure, then the sample farmers earned a large surplus. The study thus shows that the dairy enterprise is profitable. As all sample dairy farmers have some irrigated land, they are able to grow green fodder during the year on their farms.

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Environmental Implications of Livestock Enterprises in Arid Rajasthan

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Livestock pressure on grazing lands, availability and requirement of forage, the prospects of stall feeding for various classes of animals and the environmental impact of livestock pressure have been analysed with the available secondary data on land use and livestock for a representative village, a cluster of villages including the sample village, in Osian tehsil of Jodhpur district in arid zone of Rajasthan. The analysis revealed that the grazing pressure expressed in terms of adult cattle units (ACU) per unit area varied between 1.25 ACU/ha at district level to 4.28 ACU/ha at the village level. The grazing lands which included culturable and unculturable wates, permanent pastures and grazing lands and old fallows are estimated to have an average forage yield of 500 kg of dry matter per hectare. Taking an annual average requirement of forage in dry matter equivalence as 2.5 tonnes/ACU, the pressure on grazing lands with 1.25 ACU/ha at district level is excessive to the extent of more than five times. Supplies of crop residues, an integral part of the livestock forage supply system added to the supplies from grazing lands, revealed that the combined supplies from both the sources were less than the requirement by 30 per cent at the district level even after scaling down the annual requirement to 1.88 tonnes/ACU under the implicit assumption that the balance 0.62 tonne/ACU is obtained through grazing during monsoon and stubble grazing after harvest of crops.

The prospects of stall feeding for different classes of animals revealed that the availability of forage from grazing lands for animals other than bovines amounted to just 50 per cent of the requirement at the district level. The crop residue supplies for bovines can meet 83 per cent of requirement. It is inferred that stall feeding of all classes of animals is not practicable at the existing level of technology. However, stall feeding of bovines is practicable, considering that nearly 70 per cent of the total supplies of forage comes from crop residues already. Some marginal increases in crop yields along with crop residues could fill the gap that exists between requirement and supplies for bovines only. For animals other than bovines, stall feeding is not economically feasible, nor is it advised under the existing socio-economic environment, market infrastructure and price for this class of animals/animal products. For this class of animals, development of a viable and efficient market infrastructure for various livestock products promises to be the panacea for reducing their numbers and thereby reducing the pressure on grazing lands for eventually restoring their productivity status. The environmental implications of livestock enterprise is the reduced productivity of grazing lands and adjoining crop lands through over-grazing. Over-grazing has resulted in the destruction of plant cover exposing the soil to wind and water erosion hazards.

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Livestock Status in Hisar District of Haryana

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An attempt has been made in the paper to examine the composition of livestock, income and employment in dairy enterprise in different size-groups of farms in Hisar district of Haryana. The primary data were collected from a sample of 90 respondents selected from six villages of Hisar district. The highest number of draft animal power per farm was found on medium farms (1.70). The relative share in total livestock was also the highest on medium farms (24.96 per cent), followed by small (19.59 per cent) and large farms (9.07 per cent). The milch animals and young stock were found to be the highest on large farms, 3.76 and 5.06 per cent respectively. Marginal farms did not have draft animal power and the practice of custom-hiring was more prevalent on marginal and small farms. On large farms the draft animal power was replaced by tractorisation. The employment generated by the livestock enterprise was the highest on large farms (210.68 man-days), followed by medium farms (150.25 man-days), small farms (120.53 man-days) and marginal farms (86.33 man-days).

The net returns per milch animal from dairy enterprise were found to be the highest on large farms (Rs. 6,414) owing to higher productivity and economies of scale enjoyed by them, followed by medium farms (Rs. 5,315), small farms (Rs. 5,054) and marginal farms (Rs. 4,988). More than 75 per cent of the total cost was incurred on feed and fodder in all the size categories of farms. The expenses on health care were found lower on all the farms. The milk production and consumption were found to be having positive relation with farm size owing to larger number of milch animals and larger family size. On an average, about 31 per cent of total milk produced was sold and 69 per cent was consumed either in liquid form or in the form of milk products like ghee, curd, etc. The relative share of crop enterprise in total earnings was the highest on all the categories of farms. Although the earnings from dairy enterprise showed positive relation with farm size, yet in relative terms the reverse was true., Thus to increase income from dairy enterprise there is an urgent need for organising co-operative milk production societies on the Gujarat pattern and milk processing units in rural areas to add to the income as well as to generate additional employment. The draft animal power should be encouraged on co-operative/sharing basis on marginal and small holdings.

Trend in Number and Milk Production of the Milch Animals under Different Agro-Ecological Situations of Uttar Pradesh Hills

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The paper examines the trend in the number of milch animals and their milk production during the period 1984-85 to 1994-95 in different hill situations of Uttar Pradesh. The study

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is based on an intensive enquiry of 140 farmers, categorised into three groups, viz., less than 0.5 ha, 0.5-1.0 ha and above 1.0 ha, selected from 14 villages - six from the valleys (< 1000 m above mean sea level - MSL), six from mid hills (1000-1500 m above MSL) and two from high hills (> 1500 m above MSL) - of the Garhwal hills. It is revealed that there was a drastic decline in the number of milch animals during the period in the area, the valleys accounting for the highest reduction in number (66 per cent) and the mid hills for the lowest reduction (22 per cent). The number of buffaloes declined at an alarming rate of 2.7 per cent per annum in high hills, 1.43 per cent in mid hills and 1 per cent per annum in the valleys. The rate of decline in the number of cows was as high as 9.7 per cent in the valleys, 9.5 per cent in high hills and 8.1 per cent per annum in mid hill conditions. The decline in the number of sheep and goats varied from 0.4 per cent in high hills to 8.6 per cent per annum in the valleys.

The rate of change in the number of buffaloes, sheep and goats showed an increasing trend with the increase in the level of altitude whereas cows showed no definite trend. Mostly, the highest reduction in the total number of milch animals was reported in the largest size-group under the high and mid hill situations whereas in the case of valleys, the smallest size-group indicated the highest rate of decline. Such a high rate of decline in the number of animals was due to rapid conversion of pastures and grass land into crop land, large scale deforestation, ban of grazing on the reserved forests and small and tiny holdings in the valleys, leaving no scope for growing fodder crops on cultivated land.

The study further indicated that, overall, the total milk production has increased manifold in all the situations despite a drastic decline in the number of the animals during the decade. The rate of increase in milk production varied from 4.1 per cent in high hills to 8.5 per cent per annum in the valleys and it showed a decreasing trend with the increase in the level of altitude. The rate of change in buffalo milk production was the highest in the valleys whereas in case of cows it was the lowest in the valleys.

The milk productivity of buffaloes and cows showed significant increase in 1994-95 over the year 1984-85 in all the situations. The overall milk productivity showed an increasing trend with the increase in the elevation. The remarkable increase in productivity was mainly due to adoption of good quality breeds by the progressive farmers in a phased manner and replacement of uneconomic local animals during the period. The rate of increase in the milk productivity of cow was the highest in the valleys whereas that of buffalo was the highest in high hills. A declining trend was noted in the milk productivity of cow with the increase in the elevation whereas that of buffalo showed no definite trend. The size-groupwise analysis revealed the highest rate of change in the productivity in the largest size-group in mid hill and valley conditions but in the case of high hills, it was the highest in 0.5-1.0 ha group of farms.

Role of Livestock in the Household Income of Landless Agricultural Labour

P. Mohamed Dasir,* S. Kombairaju† and K.R. Ashok†

The paper analyses the impact of livestock on the income of 72 landless agricultural labour households selected from 12 villages in the two zones of Karaikal region of Pondicherry. The data were collected during 1992. The distribution of animals showed that goats, milch animals and bullocks were preferred in that order among the households. The average investment on livestock per household was estimated at about Rs. 1,356 and Rs. 2,036 respectively in zone I and zone II, accounting for 24.18 per cent and 33.42 per cent of the total value of assets. In the total annual household income of Rs. 6,716 and Rs. 7,120 in zone I and zone II respectively, the contribution of livestock was 7.74 per cent and 10.50 per cent. The regression analysis revealed that the number of days of employment and investment on livestock had significant impact on the household income. The results of the study reinforces the rationale of including livestock development as an integral part of our poverty alleviation and employment generation programmes.

Role of Dairying as an Adjunct to Crop Husbandry in Marginal and Small Farms of Gwalior District of Madhya Pradesh

V.N. Singh,† A.M. Jaulkar* and M.G. Nema†

A study was conducted in Gwalior district of Madhya Pradesh in 1991-92, based on purposive random sampling survey method, to examine the role of dairying in the farm economy of marginal and small farmers. A sample of 50 irrigated farms each from marginal and small size-groups and an equal number of unirrigated farms each from the corresponding size-groups were randomly selected representing different farming situations in the study area. In aggregate terms the contribution of dairying was higher on irrigated farms but in relative terms unirrigated farms fared better in both the size categories. Within the dairying enterprise, buffaloes contributed more than 73 per cent and 76 per cent of the total per farm income on marginal and small farms respectively. A similar trend was clearly visible under unirrigated situation though the contribution was slightly less than that of irrigated counterparts. The contribution of cows and other milch animals was comparatively higher in unirrigated situation in both size-groups, which served as shock observer and valuable asset during unfavourable conditions. The important factors responsible for low productivity of milch animals were poor feeding, high death rate, scarcity of fund, besides lack of veterinary

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facilities in the study area. It is concluded from the study that dairying as a non-land augmenting enterprise and as an adjunct to crop production played an important role in improving and propelling the farm economy of the marginal and small farmers of Gwalior district irrespective of their farming situations (irrigated and unirrigated).

Relative Economics of Milk Production from Local vis-a-vis Crossbred Cow - A Study in the Vicinity of Akola City (Maharashtra)

M.V. Manbhekar, M.R. Alshi and C.K. Joshi*

The paper attempts to work out the maintenance cost of local and crossbred cow and to study the economics of milk production from local vis-a-vis crossbred cow, based on analysis of data obtained from a sample of 25 dairymen keeping local cows and an equal number keeping crossbred cows in the vicinity of Akola city (Maharashtra). The data on feed, fodder and milk yield from the selected dairymen were collected in specially designed schedules by survey method. The data pertained to the year 1993-94.

Total maintenance cost of a local cow was Rs. 5,653 per year, of which the total variable and fixed cost formed 84 per cent and 16 per cent respectively. Feed and fodder together accounted for 60 per cent of the total cost. For crossbred cow, total maintenance cost was Rs. 10,583 per year which was higher than that of local cow by 87 per cent. Higher maintenance cost for crossbred cow is attributed to higher requirement of feed and fodder which accounted for 67 per cent of the total cost. Variable and fixed cost accounted for 86 per cent and 14 per cent of the total cost respectively. Total milk yield from a local cow was about 820 litres per year valued at Rs. 5,223. Adding income from manure, the gross return from a local cow was Rs. 5,375 per year. Thus there was a loss of Rs. 278 per year from maintaining a local cow.

Annual total milk yield from a crossbred cow was about 2,902 litres valued at Rs. 17,760. The value of manure produced was Rs. 353. Thus gross returns from a crossbred cow were Rs. 18,113 per year. This shows that dairymen maintaining crossbred cows earned, on an average, Rs. 7,530 per animal per year as net profit. Per litre cost of milk production for local and crossbred cow was Rs. 6.71 and Rs. 3.52 respectively while the price received by the dairymen for local and crossbred cow milk was Rs. 6.37 and Rs. 6.12 per litre respectively. The study thus indicates that it is profitable to maintain a crossbred cow than a local cow as evidenced by the output-input ratio which worked out to as high as 1.71 for crossbred cow against 0.95 for local cow.

The break-even output for local cow was estimated at about 1,596 litres as against the actual output of 820 litres per year. For crossbred cow the break-even milk output was estimated as 495 litres while the actual output was about 2,902 litres. The results indicate that it is profitable to maintain a crossbred cow and that the dairymen keeping crossbred cows were able to recover their total cost much earlier than those keeping local cows.

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Relative Prices of Milk and Milk Products in India

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Remunerative, fair and stable price for milk production influences input-output decisions which in turn have a significant impact on the productivity of dairy enterprise. It is generally believed that milk producers have not been getting remunerative prices for milk and their income is declining. The paper is an attempt to study the movements in relative prices of milk and milk products over time in order to test the hypothesis whether the terms of trade are moving in favour of milk producers or not. The study is based on secondary data on wholesale prices of milk and milk products, meats (including fish and eggs), cereals, pulses, edible oils, oilseeds, food articles and all commodities for the period 1961-88. It is revealed that there is a strong relationship between the prices of milk and milk products and those of other related commodities groups, i.e., the prices of milk and milk products are highly influenced by prices of these commodities. The analysis of movements in prices of milk and milk products in relation to other commodities has revealed that there has been deterioration in the already unfavourable terms of trade for milk producers even during the Operation Flood programme period. Thus the Operation Flood programme failed to ensure favourable price environment for increasing milk production and the continued unfavourable terms of trade adversely affected the milk output and marketed surplus in the country. Further, the annual growth in the prices of milk and milk products has been observed to be lower than those of other commodities' group especially after the beginning of the Operation Flood, i.e., during 1971-80. It is interesting to note that the relative growth in the price of milk and milk products was higher during the pre-Operation Flood period, i.e., 1961-70. This also supports the hypothesis that there has been a steady deterioration in the terms of trade over time. The prevailing price policy is not conducive for making investments and technological change. Thus a system to ensure remunerative price to milk producers is essential to increase milk production at farm level along with appropriate technology, for improving the efficiency of milk plants which are now operating at less than the optimum level of production.

Comparative Economics of Milk Production in Urban and Rural Areas of Madhya Pradesh

A.K. Gauraha*

The paper examines and compares the cost structure, pattern of disposal and relative economics of milk production of the urban and rural dairies, based on data collected from a sample of 18 urban dairy farms in Raipur town of the Raipur district of Madhya Pradesh and 24 rural dairy farms within a radius of 10 kilometres from Raipur town. The data were

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collected personally from the respondents and pertained to the year 1993-94. The study brought out that average daily expenditure incurred on a milch animal was higher in the urban area than in the rural area due to higher proportion of concentrate and green fodder fed to animals and higher cost of feed and fodder which accounted for nearly 68 per cent of the total cost. The average cost of production per litre of milk for crossbred cow came to Rs. 5.16 and Rs. 5.44 in the urban and rural dairies respectively, while the corresponding figures for a buffalo worked out to Rs. 6.32 and Rs. 6.33, although not much difference in the cost of production of milk in both the areas was observed. The net returns were Rs. 3.84 and Rs. 4.68 per litre in the case of crossbred cow and buffalo milk respectively in the urban area. These were, however, Rs. 2.55 and Rs. 3.67 per litre for crossbred cow and buffalo milk in the rural area. A loss of Rs. 2.13 per litre was reported in the case of local cow milk in the rural dairies. The negative returns per litre of milk for local cow were due to lower milk yield. The per day per animal yield of milk was higher in crossbred cow than in buffalo in both the areas. The profitability is lower due to lower price of cow milk as a result of lack of demand in the local markets. The pattern of utilisation of milk reveals that 96 per cent was marketed and the rest was used for domestic purposes. Of the marketed milk, 53.87 per cent was sold directly to the consumer; private agencies accounted for the rest. The per capita consumption of milk on an average farm was estimated to be 421 millilitres.

The study suggested that efforts need to be made to reduce the cost, to improve the productivities of milch animals, basic infrastructure, and to strengthen the marketing infrastructure. This can be done by introducing high-yielding varieties of grasses, legumes and fodder crops in the farmers' fields, replacing the local milch animals with improved breeds at a faster rate and encouraging the dairy farmers to organise through co-operatives which should be allowed to process and distribute milk. The necessary infrastructural facilities like veterinary hospitals, transportation, etc., have to be created for the dairy enterprise. It is also necessary to educate the farmers on scientific management of superior milch breeds and supply them standardised cattle feed regularly at cheaper rates at their door-steps.

Growth and Composition of Milch and Draught Animals in Karnataka

G.R. Patil†

In this paper an attempt is made to analyse the trends in the growth rates and composition of milch and draught animals in Karnataka. The data for this study have been obtained from the livestock census reports 1986 and 1990. Karnataka possessed a bovine population of 14.1 million in 1990 which constituted 5.2 per cent of the total bovines in the country. The total milk production was 22.91 lakh tons which was 4.4 per cent of the milk production in the country. The annual compound growth rate of cattle population declined from 0.31 per cent in 1961 to 0.02 per cent in 1990, and buffalo population also declined from 0.51 per cent to 0.036 per cent. On an average, every 100 hectares of cropped area sustained 142 bovines, which is less than the national density.

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Breedable cow and buffalo population is very important from the milk production point of view. The milch cow population declined from 32.93 lakhs in 1977 to 22.45 lakhs in 1990, the rate of decline being -0.06 per cent per annum. The growth rate of breedable cows in Mandya district was the highest (0.24 per cent), followed by Bellary (0.09 per cent) and Bidar (0.06 per cent). All other districts have shown negative growth rates of breedable cow population. The breedable buffalo population increased from 18.8 lakhs in 1977 to 22.40 lakhs in 1990, the average growth rate being 0.14 per cent. Breedable buffalo population was the highest in Belgaum district. Bijapur, Dharwad, Shimoga, Tumkur and Kodagu had greater concentration of buffaloes. Kodagu district registered the highest growth rate of breedable buffaloes. It is observed that there is a general tendency for maintaining buffaloes for milk production in Karnataka. It can also be seen that the unproductive cows are being gradually eliminated by resorting to crossbreeding programme. The reasons for the decrease in cattle population include the change over to mechanisation of farming, high cost of cattle feed as compared to the milk yield of the cattle. Buffaloes are preferred to cows for milk production. This could be due to higher productivity and higher price realisation relative to cow milk and owing to higher fat content of buffalo milk. Crossbred cattle increased at the compound growth rate of 1.52 per cent per annum. Mandya, Hassan, Tumkur, Bidar and Gulbarga had registered an average annual growth rate of more than 2 per cent.

Adult male cattle declined from 37.67 lakhs to 35.67 lakhs, the annual average rate of decline was -0.043 per cent, indicating that there is an increase in farm mechanisation in the state. The demand of milk is going to increase in the state in the coming years. The milk production will have to be increased in Karnataka as the per capita availability of milk is just 142 grams per day which is less than the national average. This could be achieved if a small proportion of indigenous herd is replaced by high-yielding cattle by crossbreeding the indigenous cows with exotic breeds and through grading up the non-descript buffaloes with improved breeds. Concerted efforts will, therefore, have to be made to increase green fodder production by increasing productivity per unit area and also by producing forage crops on fallow lands, community wastelands, grazing lands, government land on both sides of roads and rails.

Production and Disposal of Buffalo Milk in Rural Areas of District Rohtak of Haryana - An Economic Analysis

R.S. Nandal and A.S. Rana*

The paper examines the economics of milk production from buffaloes and estimates the returns to the milk producers in the marketing of buffalo milk in rural areas of Rohtak district of Haryana. The study is based on data collected from a sample of 134 milk producers and 40 milk vendors selected from four villages in Rohtak district. The milk producers were classified into three groups, namely, small having 1-2 milch animals, medium having 3 to 5 milch animals and large having over 6 milch animals. The selected sample consisted of 40 small, 58 medium and 36 large milk producers. The data pertained to the year 1994-95.

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The study showed that the total cost borne by the producer for maintaining a buffalo during one year period of lactation was Rs. 14,599. The major expenditure was on feed and fodder constituting about 71.63 per cent of the total cost. The per litre cost of milk incurred by the producer was Rs. 7.73. It was further noted that the gross returns to a producer over a buffalo were Rs. 16,872 in one year lactation period. Thus the annual net returns to a producer over a buffalo were found to be Rs. 2,273.

The study further showed that the average price received by the producer by selling one litre of milk was Rs. 8.65, whereas the price received by the middleman (milk vendor) was Rs. 11.51 per litre. A milk producer received a net margin of Rs. 1.21 per litre, whereas a middleman earned a net margin of Rs. 2.11 per litre. This shows that the returns to a middleman in the marketing of buffalo milk were much higher compared to the producer's returns. Efforts should be made to minimise this gap and for this, the average price of pure milk of a buffalo should not be allowed to fall below Rs. 9 per litre. On the other hand, the producers in the villages should increase the milk yield of their milch animals by feeding with adequate balanced nutrition, proper care and management. The farmers should also be supplied with high-yielding milch animal breeds.

Costs and Returns of Dairy Enterprise as an Adjunct to Crop Husbandry in Vidarbha Region of Maharashtra State

N.A. Gadre†

The paper examines the costs and returns from milch animals and contribution of dairy and crop enterprises to the total farm income of different size-groups of farms in Vidarbha region of Maharashtra. The data collected in the cost of cultivation scheme pertaining to the years 1992-93 and 1993-94 were used for the purpose. The study covered a sample of 113 farms selected from eight districts of Vidarbha region in each of these years. In calculating the economics of dairy as a business, the total expenditure not only on milch animals but also on dry animals and calves were taken into account.

The number of milch cattle per holding was observed to be 2.67, 2.41, 2.55 and 2.75 in small, semi-medium, medium and large size-groups respectively. The corresponding number for dry cattle was 0.64, 0.99, 1.46 and 1.12, indicating thereby that the ratio of dry to milch cattle increased with the increase in the size of holdings, except in the large size-groups. The cattle population scenario showed direct relationship between the number of cattle and the size of holdings. Out of 74 milch cows, 70.94 per cent belonged to the Jersey breed, whereas out of 229 milch buffaloes, 87.31 per cent belonged to the Nagpuri breed.

The total cost of rearing a crossbred cow and buffalo worked out to Rs. 7,665 and Rs. 9,902 respectively, whereas the gross returns were Rs. 10,496 and Rs. 10,269 respectively. Further, it was observed that the highest net returns were obtained by the small farmers from both a crossbred cow and a buffalo which worked out to Rs. 3,891 and Rs. 1,053, giving an input-output ratio of 1:1.41 and 1:1.08 respectively. From this it can be said that milch animals can play an important role in increasing the income of the small farmers through

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regular cash flow.

As regards net returns from crop and dairy enterprises, positive net returns were observed in all the categories of farms in respect of crop enterprise. But the net returns were negative in dairy enterprise in all the categories of farms, except in the small size-group where the net returns came to Rs. 716 per farm due to relatively low ratio of dry to milch cattle. As such, in order to increase the net returns from dairy enterprise there is a need to reduce the ratio of dry to milch animals. The efficiency of investment of crop and dairy enterprises was judged by working out the returns per rupee of investment. It worked out to 1.12, 1.31, 1.38 and 1.28 respectively in the four size-groups of farms for crop enterprise, whereas the corresponding figures were 1.02, 0.83, 0.84 and 0.88 for dairy enterprise. It showed that in general crop enterprise is more profitable than the dairy enterprise.

Income and Employment Opportunities under Dairy and Crop Enterprises

V.K. Choudhary*

In Chhattisgarh region of Madhya Pradesh, information on the role of dairying as an adjunct to crop enterprises in a typical farming complex is lacking. An attempt has been made in this study to find out the role of crop and dairy enterprises in income generation and sustainable rural employment and labour utilisation. The data for the study were generated by personal interview from two villages, namely, Jora and Labhandi of Dharsiwa block of Raipur district and pertained to the year 1994-95. On an average, 15 households were selected from each village. These 30 households were divided into three categories, i.e., dairy with agriculture, agriculture with dairy, and dairy with other occupation. Further, dairy enterprise was divided into two classes depending upon the number of milch cattle. Dairy enterprise generates better economic returns in farming situations of agriculture combined with dairy enterprise specially with large dairy herd size due to minimum cost of milk production, using surplus farm family human labour and by-product. The study further indicates that male labour power is mainly responsible for the viability of the dairy enterprise. The percentage of female labour engaged in both the categories is more than that of male labour. The results suggest that such mixed enterprise offer a promising scope for development of marginal and small households.

Growing Livestock and Fodder Availability in Arid Western Plain Zone of Rajasthan

Rajesh Sharma and Madhu Sharma†

The paper examines the nature and magnitude of changes in the livestock population in the context of climatic conditions, fodder availability in the arid western plain zone of

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Rajasthan (zone I a), covering Jaisalmer, Barmer, Bikaner, western Jodhpur and western Churu and suggests measures for better management. The data for livestock population, rainfall, land use pattern, etc., were collected from secondary sources. Simple tabular analysis was done. Fodder availability and its requirement for the zone were calculated for the normal agricultural year 1992. All the animals were standardised in adult cattle units (ACU) to estimate the fodder requirement. Fodder production potential was considered at the rate 0.3 tons/ha. and yearly fodder requirement was considered to be 2.5 tons/ACU. To study the impact of rainfall on livestock population, rainfall data were examined and three draught periods were identified, i.e., 1968-69, 1974 and 1984-87.

The total livestock population of the zone increased by 58 per cent from 6.92 millions (61 heads per sq. km) in 1961 to 10.95 millions (97 heads per sq. km) in 1992. During low rainfall years from 1966 to 1971 the total livestock population declined by about 13 per cent, specially cattle population, the decline being 47 per cent. Goat and camel population increased in this period. The impact of drought from 1984-87 was so severe that the livestock population in the zone declined by 35 per cent. After 1988 census, the livestock population increased by about 44 per cent in just five years, specially goat which increased by about 69 per cent. The percentage of cattle population in the zone has shown a decrease. The number of adult animals among cattle and buffalo has increased in the state. Among cattle, the proportion of females out of adult animals, which was 74 per cent in 1961, increased to 89 per cent in 1992 in the zone.

The total fodder requirement as per 1992 census was about 8.38 million tonnes while total fodder availability, based on land use pattern in a normal rainfall year, 1992, was 6.69 million tonnes, showing a shortage of about 20 per cent. Each adult cattle unit needs 2.5 tonnes of fodder per year as against the availability of 1.99 tonnes per year. Looking to the increasing livestock population and low forage yield of grazing lands, it could be assumed that fodder needs have to be met from wastelands and fallow lands, leading to hazardous effect on ecological balance.

It is suggested that the indigenous breeds of cattle need to be improved and that better health facilities need to be provided. It is also necessary to ensure the provision of sustained fodder availability and to improve livestock-based industries. Sustained fodder availability could be met by improving productivity and rehabilitation of over-exploited grazing lands, by bringing new area under pastures, conservation and storage of fodder and reduction in livestock numbers by culling and castration of useless animals. Livestock industries could help in making livestock rearing more profitable in the zone.

Bovine Sector in Punjab: Trends in Growth and Composition

C.S.C. Sekhar*

The paper attempts to study the pattern of growth and changes in the composition of the bovine population in the Punjab. The time period of the analysis is 1966-90 and the analysis is done at the state as well as sub-state levels. At the sub-state level the districts are grouped

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into three zones based on the agro-climatic sub-zones into which the districts fall. The data sources are various issues of Livestock Census, *Indian Agricultural Statistics and Statistical Abstracts of Punjab*. The analysis at the state level reveals the following features. The growth rate of cattle stock has shown a continuous fall (-0.4 per cent) and of the buffaloes has increased (2.6 per cent). The draught animals have decreased (-2.2 per cent) and the milch animals have increased (2.7 per cent). The proportion of cattle vs. buffalo is increasing in favour of buffaloes (1.3 per cent) except in the category of draught animals where it is constant. The proportion of male vs. female bovines is increasing in favour of female bovines even in the case of cattle.

All the growth and compositional features noted at the state level are observed at the sub-state level in all the three zones uniformly, showing a lack of any region specificity. At the sub-state level in terms of the growth patterns in bovine sector across zones, the zones with the highest proportion relative to other zones have shown the lowest growth rate. On the contrary, in the case of negative growth, the zones with the highest proportion have reported the highest growth rate. In zone II cattle is more predominantly used for draught purposes whereas in zone III buffaloes are used more for draught purposes despite the presence of a large proportion of cattle population. The regression analysis to identify some of the causal factors for the growth in the bovine stock has yielded the following results. The density of rural population and feed and fodder from non-agricultural sources have turned out to be significant variables in explaining the milch buffalo population density. The percentage of small and marginal farmers and the number of carts per net sown area are the significant variables in explaining the variations in draught cattle density. The percentage of milch bovines in the adult stock is the significant explanatory variable in the case of female bovine young stock. The survival rate of male calves and the calving rate of adult cows are the significant variables in explaining the variation in the percentage of male cattle young stock. With the clear shift towards dairying in all the zones of the state, this sector may be given more allocation by providing the necessary infrastructure. The most important among these are veterinary aid institutions, marketing channels and extension facilities. But with the increase in emphasis on crossbreeding programme, the feed and fodder availability in the state has emerged as the major input. A comprehensive estimation of gaps between availability and requirement at state and sub-state levels is urgently needed.

Impact of Operation Flood Programme on the Economy of Rural Milk Producers in District Kanpur-Dehat (Uttar Pradesh)

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An attempt has been made in the paper to examine (a) the level of investment and resource use pattern in milk production and (b) the impact of Operation Flood programme on

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production, consumption and marketed surplus of milk and on income and employment generation on different categories of milk producers in Uttar Pradesh. The study covered a sample of 160 farmers (80 from the programme area and an equal number from the non-programme area) randomly selected from four villages of Malsa and Patara development blocks of Kanpur-Dehat district. The average size land holding of the farmers was 4.70 and 4.29 acres each in the programme and non-programme areas respectively. There was no major difference in land holdings. The landless labourers and marginal farmers constituted about 64 per cent of the total households in the programme area as compared to 60 per cent in the non-programme area. The average number of milch animals was higher (2.41) in the programme area than in the non-programme area (1.96). The investment pattern in dairy enterprise revealed that the average investment per household was Rs. 17,648 in the programme area as compared to Rs. 11,374 in the non-programme area. The higher investment could be mainly due to the higher value associated with the superior quality of animals maintained by the households in the programme area.

The overall average cost per milch animal and per household per annum was Rs. 7,588 and Rs. 18,286 respectively in the programme area as compared to Rs. 6,854 and Rs. 11,584 in the non-programme area. The average annual net income was much higher and amounted to Rs. 4,872 per milch animal per annum and Rs. 11,742 per household per annum in the programme area as compared to Rs. 2,491 per milch animal and Rs. 4,883 per household per annum in the non-programme area. The average cost of milk production per litre for the group as a whole was Rs. 3.59 and Rs. 3.67 in the programme and non-programme areas respectively. The overall average milk production per day per household was higher at 8.78 litres in the programme area as compared to 6.04 litres in the non-programme area. The average consumption per household per day was 2.23 litres and 1.92 litres in the programme and non-programme areas respectively and the overall marketed surplus of milk per household was also high at 6.55 litres in the programme area as compared to 4.12 litres in the non-programme area. About 75 per cent of the total milk output was marketed in the programme area as against 68 per cent in the non-programme area. The overall human labour use, including family and hired, in the dairy enterprise was higher at about 440 work days and 289 work days in the programme and non-programme areas respectively during the year. The average family labour use accounted for about 95 per cent of the total labour employment in the dairy enterprise in both the areas. It may be concluded that the Operation Flood programme has helped to generate employment and augmented the income for the weaker sections of rural society, increased their investment capacity and enabled them to produce more milk at lower cost.

An Empirical Investigation into Behaviour of Prices and Export Potentials of Buffaloes in Punjab

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The main objectives of the study were: (i) to examine the magnitude of growth of total number, volume of exports, export price of buffaloes and export earnings therefrom, (ii) to

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analyse seasonal and secular variations in buffalo prices, and (iii) to identify the factors affecting prices and exports of buffaloes in Punjab. It is based on both secondary and primary data. The secondary data pertained to the period 1982-83 to 1991-92 were collected from *Statistical Abstracts of Punjab*. The primary data were obtained from a project: "A Study on Marketing of Livestock with special reference to Milk Bovines in Punjab". The analysis of the data indicated that the total volume, export quantum, export price of buffaloes and export earnings therefrom all showed a significant increase over the study period. The estimated compound growth rates of these variables were 3.02, 26.09, 7.69 and 35.99 per cent per annum respectively. The new economic policy of 1991 seemed to have influenced cattle trade in the state. The volume of exports of buffaloes has shown a galloping increase of 501 per cent during 1991-92 over the preceding year. Also the ratio of exports of buffaloes to total number of buffaloes rose to the extent of 27.39 per cent. The export earnings from buffaloes fetched Rs. 29.86 crores during 1982-83, of which the male and female calves contributed Rs. 0.98 crore. After a decade, the exports jumped to a record amount of Rs. 956.19 crores, of which male and female calves contributed Rs. 35.12 crores (3.67 per cent of the total earnings).

The buffalo prices indicated a rise of Rs. 436 per annum during the period under study. The seasonality of prices was observed to be maximum in July and minimum in October. The increasing trend in prices during May and June was mainly due to limited supply of milch animals in these months.

The negative attributes of buffaloes such as short tail, straight horns, erratic temperament, abnormal size of teats, non-cylindrical shape of teats, broken udder, male calf and bad general appearance had all discounted the price of a buffalo to the extent of Rs. 246, Rs. 176, Rs. 316, Rs. 312, Rs. 252, Rs. 755, Rs. 482 and Rs. 1,035 respectively. The non-descript breed indicated a price discount of Rs. 752 down the average price of a more preferred Murrah breed. The estimates of price regression model showed that a buffalo in milk would command a maximum price of Rs. 14,026 when she was in the first month of her third lactation and yielded 14 litres of milk per day.

The results of the study have far reaching policy implications. The non-descript breed could be used for meat purposes and export not only to other states of the country but also to foreign lands. This would go a long way in lessening the mounting pressure of animals on scarce land resources. The exportable surplus could be disposed of and trade of buffaloes would be an economical proposition. If export of animals is encouraged through policy instruments, the earnings from the livestock could be enhanced to a greater extent.

Livestock Economy and Dairying in Hills: A Case Study of Himachal Pradesh

D.S. Thakur†

The hill economy is mainly agro-pastoral with no scope for big industries due to the lack of enough raw material as well as difficult accessibility, transportation and communications.

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The agricultural holdings in hills are small and scattered with marginal and small farmers constituting more than 84 per cent of the total holdings. For such marginal and small holders, livestock in general and dairying in particular constitute an indispensable and important possession. As a matter of fact livestock as well as dairying is more important for hills than for plains. The contribution of animal husbandry to national income at the all-India level is hardly 6 per cent whereas the same in hills (H.P.) is as high as 15 per cent of the state income.

This study examines in detail the nature and significance of the changes taking place in the livestock economy in general and dairy sector in particular in hills and the factors underlying the changes. The trends in the size and number of milch animal stock, draught animals, milk production, relative importance of cows and buffaloes in total milk production and the characteristics of dairying in hills have been analysed and described in the paper. The progress of dairying development on the Anand Pattern and the contribution of dairying to the income of farmers in hills have also been studied.

The study shows that the livestock population has constantly increased from 42 lakhs in 1966 to 51 lakhs by 1992. The cattle population numbering 21 lakhs, together with 7 lakh buffaloes, constitutes more than 50 per cent of the total livestock economy of hills. The number of bullocks has increased from 8 to 9 lakhs outnumbering cows (7-8 lakhs), the remaining being calves below three years of age. The milk production has registered a quantum jump from 1.78 lakh tonnes in 1961-62 to more than 6.53 lakh tonnes by 1993-94. The rate of increase in the output of cow milk has been quite substantial due to crossbreeding and dairy development programmes.

The number and membership of milk co-operatives, and income of farmers from dairying have increased rapidly over the years. The marginal farmers earned more than 54 per cent of their total income of Rs. 27,484 from dairying, small farmers nearly 48 per cent of their total income of Rs. 29,260 and large farmers 40 per cent of their total income of Rs. 45,223 from dairying per family per annum. The per capita availability of milk has also increased significantly from a mere 172 grams in 1961-62 to 336 grams in 1993-94 which has been higher than the national average at the all-India level.

In view of the greater importance of livestock economy and dairying for hills as compared to plains, the study makes a strong case for massive investment and financial assistance for livestock improvement and dairy development in hills by both national and foreign institutions like nationalised banks, National Dairy Development Board, Government of India, State Government, World Bank, etc.

Changes in Population of Farm Livestock Over Time in India

R.N. Pandey and A.C. Gangwar*

An attempt has been made in the paper to analyse the changes in the livestock population and the composition and growth rates of the main farm animals in India over the period 1951-87. The composition of farm livestock has changed substantially over time. In the total livestock population in India, the percentage share of cattle and sheep has substantially

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declined with the passage of time whereas it has increased in the case of buffaloes and goats. The buffalo has emerged as the most important milch animal. The annual compound growth rates in the total population of cattle, buffaloes, sheep, goats, and total livestock during the last 36 years (1951 to 1987) were 0.70, 1.81, 0.42, 2.38 and 1.17 per cent respectively. The bulk of the rural households maintain one or two milch animals. The highest density of cattle per square kilometre of total geographical area during 1987 was observed in West Bengal (229), followed by Bihar (120), Assam (93), Uttar Pradesh (89), Kerala (88) and for the country as a whole it was 54. Similarly, the highest density of buffaloes was observed in Punjab (111), followed by Haryana (87), Uttar Pradesh (62), Andhra Pradesh (33), Bihar (28), Tamil Nadu (24), Gujarat (23) and for the country as a whole it was 23. The average density of sheep and goats per square kilometre of geographical area in India was 14 and 34 respectively in 1987. In regard to density of sheep, the most important state was Tamil Nadu (45), followed by Rajasthan (29), West Bengal (26), Andhra Pradesh (25) and Karnataka (25). Similarly with respect to density of goats, the important states were West Bengal (256), Bihar (86), Tamil Nadu (46), Kerala (41), Uttar Pradesh (38) and Rajasthan (37). The density of total livestock in India was 136 in 1987 and it was the highest in West Bengal (533), followed by Bihar (250), Uttar Pradesh (208), Punjab (192), Tamil Nadu (192) and Haryana (185). In the total population of cattle and buffaloes, the percentage of milking animals had registered a significant increase over time which is a very healthy sign. Among the most important milk producing states, Uttar Pradesh ranked first, followed by Punjab, Madhya Pradesh, Rajasthan, Tamil Nadu, Gujarat, Maharashtra and Haryana. However, the average per capita annual production of milk was the highest in Punjab (246 kg), followed by Haryana (193 kg), Himachal Pradesh (104 kg), Rajasthan (96 kg), Gujarat (81 kg), Madhya Pradesh (68 kg) and Uttar Pradesh (66 kg). The number of farm livestock per thousand of population has declined over time. Therefore to meet the increasing demand for livestock products, the production capacity and the productivity of farm animals should be increased substantially.

Livestock Composition and Trends in Haryana

B.S. Tomer and Dalvir Singh†

Haryana being a smaller state made greater strides in the development of agriculture harnessing the advantages of green revolution and through creation of better infrastructure in the agriculture sector. But livestock enterprises have not been given much importance. Hence, a study has been undertaken to throw some light on the changes in the livestock composition and its growth in the state during the post-green revolution period. It is based on secondary data taken from quinquennial livestock censuses from 1966 to 1992.

The study reveals that in Haryana the composition of livestock population in general and that of bovine in particular have changed significantly during the post-green revolution period, 1966-92. While the cattle population was almost stagnant, the buffaloes have increased more than double during the period. Buffalo is the main milch animal in the state

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and Murrah is the main buffalo breed. The ratio of buffaloes to total bovines has increased to 67 per cent and its share in the total milk production of the state is about 80 per cent. It is mainly because of higher productivity of buffalo than of the cow and decreasing economic importance of male cattle used for work due to increasing mechanisation in the state. This is evident from the fact that while the number of male cattle used for work has gone down to half, the operational area of land per tractor has decreased from 712 hectares in 1966 to 27 hectares in 1992 in the state. This indicates that the importance of cow as a double purpose animal for milk and for draught has declined with the passage of time.

Further, the ratio of breedable female cattle to total cattle and the percentage of cattle in milk showed an increasing trend during the period. The ratio of breedable crossbreds to total breedable cattle also went up from 13 per cent in 1982 to 23 per cent in 1992, suggesting that the animals of higher economic importance received more attention of the owners.

The other livestock maintained in the state included sheep, goats, camel and poultry. The study reveals that while the increase in sheep and goat population was about 100 and 50 per cent respectively during the period, the camel population showed a small declining trend. However, the poultry in the state seems to be a promising enterprise since its index increased to 1800 in 1992 as compared to the base year 1966.

A study conducted in Hisar, Bhiwani and Sirsa districts of Haryana revealed that while there was greater variation in land resources among rural households, the average number of bovine animals ranged only from 3.49 to 7.40 on landless, small, medium and large farm households. Further, in the total income of the household, the share of income from dairy enterprise increased with a decline in the land area. Thus the study suggests that livestock enterprises play an important role in supplementing the income of the rural poor having smaller land base. Hence, the planners need to pay more attention to the development of livestock enterprises particularly those which are showing better growth and which are promising propositions such as rearing of buffaloes, sheep and poultry in Haryana.

Demand for and Supply of Livestock Products in Haryana: Structure and Projection

K.N. Rai, S.P. Singh, J.C. Karwasra and S.N. Singh*

Income elasticities of demand for milk and milk products and meat, eggs and fish were estimated based on National Sample Survey data for the years 1965-66 and 1987-88. Further, demand and supply functions were fitted to the data and projections were made using coefficients derived through demand and supply functions and the information on explanatory variables generated through linear growth on time-series data. The findings of the study reveal increasing consumer preferences for meat, eggs and fish in rural Haryana. Over the years, in general, the percentage expenditure on milk and milk products and meat, eggs and fish to the total expenditure has increased in the rural and urban areas of the state. In the rural area an upward shift in income (expenditure) elasticity of demand was observed in 1987-88 over 1965-66. Contrary to this, there was a decline in the expenditure elasticity

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in the urban area. Net state income and human population were found to be the important factors influencing the demand for milk in the state. As expected, price of milk exercised negative impact on milk demand. In the case of meat and eggs no particular factor could be isolated playing a dominant role in their demand. For supply, price of product and number of animals were found to exercise significant impact on supply levels. The supply of milk, meat and eggs in the state which is presently in excess of demand is likely to be surpassed by the demand in the near future with the present scenario in demand and supply.

Input Service Management of Dairy Co-operatives - A Farmer-Oriented Evaluation

George Thomas and K.P. Mani†

Operation Flood, as a programme of dairy development, aimed at augmenting milk production, *inter alia*, through an integrated package of input services provided at the producers' level. However, in practice, this function was allegedly side tracked despite considerable progress made in areas like milk marketing. This paper makes an attempt to make a farmer-oriented evaluation of input service management of Anand Pattern dairy co-operatives of Ollukkara block, Trissur district (Kerala). In addition to the data from the books and records of the societies, 90 farmers from three dairy co-operatives were interviewed for collecting the primary data. The reference year of the survey was 1993. Analysis is done with percentage method and satisfaction index method. The study revealed that a considerable number of respondents were unaware of the provision of two of the input services from the societies, namely, veterinary services and supply of fodder seeds. Only a smaller number of them availed of these services. Though all the respondents were aware of the main input service, i.e., the supply of concentrates feed, 26 per cent of them did not utilise even this service from the societies. The total sale of concentrates feed by the societies during the study period was only as low as 23.68 per cent of the total requirement of the farmers. They met the rest of the requirement of 76.42 per cent from the private traders as no other source for concentrates was available.

Farmers' satisfaction in enjoying the provision of the service of concentrates feed through the societies was also studied. The analysis with eight satisfaction determining factors shows that the aggregate level of satisfaction was negative. In fact, the farmers were satisfied to a considerable extent on three of the factors (price of feed, mode of collecting payment and attitude of societies' officials and staff) but on all other factors (feed availability, choice of preferred brand, quality of feed, convenience of supply time, and supply in convenient quantity) they were dissatisfied in varying degrees. This micro level study provides insight on the input service management in dairy co-operatives. Sincere and concerted efforts from the part of societies seem to be missing to attract farmers to such services. Orienting the services more to the customer needs, giving due attention to the dissatisfying factors, will go a long way in imparting vitality to organised dairy farming.

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Trends in Agricultural Mechanisation and Bovine Population in Himachal Pradesh

T.R. Sharma and N.K. Sharda*

The paper seeks to examine the trends in agricultural mechanisation and cropping pattern and their resultant impact on the draught animal population and the changes in the overall composition of bovine stock in Himachal Pradesh. The study is a comparative static exercise at two points of time, 1972 and 1992. It relies mainly on secondary data taken from the reports of Livestock Census of Himachal Pradesh, Annual Season and Crop Reports, etc. The study reveals that there has been a significant improvement in agricultural mechanisation in the low lying districts and the valley areas of the state during the last two decades. During this period, there has also been a shift in cropping pattern in these areas mainly indicating lower allocation of total cropped area to paddy. In mid and high hill wet zones of the state a significant proportion of the area which was earlier under field crops has been brought under fruit crops due to higher returns as compared to traditional crops. The improvement in agricultural mechanisation and changes in the cropping pattern have resulted in a decline in the requirement of bullock man-days in agriculture. Consequently, the number of draught animals has declined in six districts of the state during 1972-92. Due to this the density of draught animals per unit of net sown area has either come down in most of the districts or it has remained stagnant during the reference period. The shrinkage in the average size of holding from 1.53 hectares in 1971-72 to about 1.20 hectares in 1991-92 has definitely contributed to a reduction in the draught animal population in the state. The proportion of cattle in total bovine population has also registered a downward trend. On the other hand, this ratio is increasing in the case of buffaloes in more parts of the state because of their higher productivity when compared to that of the cows.

Due to the small size of holdings most of the cattle population in the state depend mainly on open grazing, thereby causing destruction to the pasture and forest lands resulting in soil erosion. The growing number of buffaloes in the total bovine population should not cause much concern inasmuch as these are generally stall-fed and may not cause great damage to the environment. Besides, their higher productivity can significantly improve income levels in the rural areas. The decline in the number of draught animal population is a positive development towards the reduction in the overall pressure of livestock on land so that the fragile ecosystem of this hill state is not disturbed. Finally, it may be pertinent to mention that the existing agricultural machinery is mainly suitable for plains. Its application in the hilly areas is not feasible due to geophysical conditions and relatively small size of holdings, steep slopes and scatterness of fields, lack of assured irrigation facilities, etc. Under these circumstances, the mechanisation of agriculture offers limited scope until efforts are made to adapt existing machinery to the requirements of hill areas.

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Dynamics of Livestock Development in Hilly Areas: A Case of Himachal Pradesh

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An attempt has been made in the paper to study the changes in the composition of livestock population and to work out the growth rates of the livestock in Himachal Pradesh during the period 1951-92. The study seeks to know whether the compositional change is guided by public policy or determined by market forces and whether the direction of change is suitable for the overall development of the state. More than 92 per cent of the population lives in rural areas and earn their livelihood from agriculture, horticulture and animal husbandry. Livestock rearing is practised generally as part of a mixed farming system. Livestock provide milk, mutton, wool, hides and skin, manure, draft power in agriculture, transport, etc. It also provides self-employment, particularly to the socially disadvantaged including rural women. It plays an important role in supplementing rural incomes. These roles are performed by different types of livestock. The composition and growth of livestock depend on the agro-climatic condition, social status, economic condition of the household, market forces and natural resource endowments.

The following conclusions emerge from the analysis. Livestock composition is changing in favour of buffaloes and small ruminants. In spite of all governmental efforts, in the development of cattle there was no significant achievement, rather in sub-tropical zone it is being replaced by buffaloes. This is also because of increasing mechanisation and use of fertilisers. In the dry temperate and alpine zone where livestock rearing is a major occupation because of horticultural and other developments, the survival mechanism/strategy of the people is gradually shifting. In the humid/sub-temperate zone there seems to be overstocking of cattle, mostly of local breed with low productivity and mostly to provide draught power and manure to agriculture in the area. So far the policy makers have failed to address the problem of number of livestock directly. The efforts were mostly partial to improve productivity in terms of higher milk yield, and other dimensions of livestock development were missing. Emergence of buffaloes for milk in the sub-tropical zone raises the hope for milk based commercial activity.

Small ruminants, i.e., sheep and goats have mixed growth. The number of sheep is declining while goats are becoming important in all the districts of the state. The growth in goat population is mainly guided by the market forces, i.e., the demand for meat within and outside the state is increasing. Presently, animals are overstocked for two reasons; firstly, livestock rearing is based on grazing, involving virtually little private cost, it is mostly social cost. Secondly, the concern is to get more manure to maintain the fertility of soil for agricultural activities. The substitution of manure by fertilisers in hills is difficult because the hill soils are light shallow and low in humus contents. Thus without organic manures crops cannot be grown profitably. Also the availability of draught animal at right time to use soil moisture is very critical in farming. In the absence of lease and exchange market for bullocks, the farmers prefer to own bullocks.

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Lastly, the increasing numbers of small ruminants, particularly goats, are considered as the greatest source of damage to forest and other vegetation in the ecological fragile areas of the state. In fact, the contribution of sheep and goats to this fragility could have been only marginal. The more important factors which are responsible for degradation of these areas can be listed as the extension of cultivation to marginal lands, indiscriminate grazing by large numbers of unproductive cattle, growing pressure on account of demand for fuelwood, commercial timber, raw material for industry, etc. To stop further ecological degradation and for eco-restoration there is need for several positive measures, such as eco-development approach, pasture development and regulated grazing of animals.

Growth, Availability and Utilisation of Bullock Labour in Himachal Pradesh

Amresh Sharma, M.L. Sharma and S.P. Saraswat*

The paper critically examines the growth, availability, utilisation of draught power and mobilisation of surplus bullock labour for economic development in different agro-climatic conditions of Himachal Pradesh. The study is based on data collected from a sample of 60 farm households from six village clusters selected from the three districts of Kangra, Mandi and Shimla, representing the three agro-climatic zones - low, mid and high hills - of the state. The data on monthwise utilisation of bullock labour were obtained from the selected households by the cost accounting method during the year 1991-92. The study shows that a rapid fragmentation of holdings has taken place between 1970-71 and 1990-91. The compound growth rate of the holdings was about 3 per cent per annum for the state as a whole and it was 3.95, 3.01 and 4.12 per cent per annum in Kangra (low hills), Mandi (mid hills) and Shimla (high hills) respectively. During the same period, the rate of increase in the bullock population was marginal except in high hills where it declined.

In the state per farm availability of bullocks declined from 1.73 during 1970-71 to 0.98 in 1990-91. Overall, it was noted that with the increase in the elevation the number of animals also showed an increase. The monthwise pattern of available bullock pair days on per farm basis in different size-groups in different zones revealed the fact that more than 60 per cent of bullock labour is surplus for six months in all the zones and in all the size-groups of farms. This is due to specific difficulties in the utilisation of surplus bullock labour because hill agriculture has small, scattered and terraced fields. Moreover, it is not possible to mobilise the bullock labour for use in any other sector of the economy and at the same time bullocks are used in pairs. Therefore, there is practical difficulty to reduce the bullock strength on the farms. To solve this problem it is suggested that co-operative farming should be encouraged for full employment of bullock labour which will ultimately generate revenue to the animal owners. There is a need to consider the reorganisation of large number of holdings through reconsolidation. It would not only facililate in making an extensive and effective use of bullock labour but may also increase the technology adoption.

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Crossbred Cow Technology and Bovine Composition: Evidence from Punjab Villages

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The paper examines the impact of induction of crossbred cows on the buffaloes and local (*desi*) cows with the help of 1,408 village economies of Patiala district. Of the total livestock inhabited villages, 1.78 per cent (25 villages) reported absence of adult crossbred cows. Only one-tenth of the villages (147) recorded more than 100 adult crossbred cows. About half of the villages (694) had 20 to 50 crossbred cows. At the lower end of the crossbred cow spectrum, about one-tenth of the villages (129) listed upto five crossbred cows and another about one-tenth of the villages (127) less than ten crossbred cows. The effect of induction of crossbred cows on the livestock economy of the village is marked, in the initial round, in the sense that they substituted local cows and buffaloes; of course, the overall number of female animals (cows and buffaloes) remains in the range of 230 to 360. As the village female livestock population moves between 400 to 750, the role of crossbred cows gets confined, at most, to replacement of local cows and buffaloes. Beyond the 800 limit they appear to act as supplement to additional demand rather than act as replacement or substitute for local cows and buffaloes.

The replacement of local cows by crossbred cows is feasible, only if the rate of reproduction of crossbred cows is substantially higher than that of local cows. In fact, the reproduction rate is substantially higher in the case of crossbred cows in Punjab as well as in Patiala district (0.6787 and 0.7) compared to buffaloes (0.5585 and 0.6048) and local cows (0.5263 and 0.4286). A discernible inverse relation exists between the population of female crossbred cows and their reproduction rate but not in the case of local cows and buffaloes. The fact that induction of crossbred cows prefers those areas which enjoyed a good market for milk is revealed by a relatively stronger positive correlation between crossbred cows and buffaloes ($r = 0.54$ for the adults' set and 0.59 for the totals' set) compared to the one with local cows ($r = 0.51$ for adults' set and 0.50 for totals' set).

The slope coefficients obtained on regressing local cows on crossbred cows and buffaloes on crossbred cows are positive and statistically significant. Less than unit value of the coefficients with respect to local cows implies that there exists partial substitution of local cows by crossbred cows. In contrast, more than unit value of the coefficients in the case of buffaloes implies that crossbred cows tend to supplement the milk yielding capacity of buffaloes. An acceleration in the growth of population of crossbred cows causes, as captured by second-order coefficient of a parabolic function, a deceleration in the growth rate of buffaloes. In contrast, local cows which are substituted by crossbred cows show diverse response behaviour.

To sum up, a crossbred cow acts as a substitute of other female livestock population in a small sized, probably family need catering, village economy. As the livestock economy

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of the village attains medium size and starts catering to, apart from self-consumption needs, local market demand as well, the role of crossbred cows remains confined to replacement of local cows in particular and buffaloes in general. However, as the livestock economy of the village attains large size and faces a well organised commercial milk market, the crossbred cows appear to supplement the stock of local cows and buffaloes, augmenting the existing milk production capacity of the village economy. The policy import of the analysis is that there is need to keep a constant vigil on the breed purity of crossbred cows, particularly in the present phase of livestock development when these have to compete with the select best set of commercially viable breed of buffaloes and local cows.

Economic Viability and Environmental Impact of Livestock Enterprise in Himachal Pradesh

Dalbir Singh*

The paper attempts to study the economic viability of livestock enterprise of different farm sizes and its environmental impact in different agro-climatic zones of Himachal Pradesh. Three representative cluster of villages have been selected from the low, mid and high hill zones for in-depth verification. Both primary and secondary data have been used to meet the objectives in hand.

The study concludes that the rural households often keep more animals for meeting the requirement of farmyard manure and other livestock products because they have to bear much smaller private cost to maintain the animals being fed on common resources. These resources contribute a great deal in supporting the livestock population in the form of fodder, litter and cattleshed material supply and providing grazing facilities. In the absence of common property resources (CPRs), it is not possible for the rural households in general and the landless, marginal and small size households in particular to rear their animals even for meeting their basic needs. In other words, CPRs help to make the livestock enterprise viable in the hilly areas like Himachal Pradesh. The study also found that the higher dependence of rural households for rearing their animals also causes high pressure on CPRs. The CPRs are facing speedy depletion in certain areas because of increasing number of animals. There is not only an urgent need to curb this depletion but also to sustain and enhance the carrying capacity of these resources so that the productivity of animals can be increased and environmental balance be sustained. The following measures deserve consideration in this regard.

Firstly, to reduce the livestock pressure on CPRs, it is important to discourage the rapid growth of uneconomical animals which do not contribute to income generation of the rural households. Under various anti-poverty programmes the poor households have opted for animal husbandry-based activities without taking care of their fodder producing capacity. This further leads to the presssure on the resources. Thus there is an urgent need to modify

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such government-sponsored programmes which may help in reducing the livestock pressure on fast-depleting resources. Secondly, to increase the carrying capacity of CPRs, rotational grazing on pasture lands must be undertaken. Apart from increasing the carrying capacity of these resources, it will also help in making available greater quantity of fodder for animals. Finally, the development of CPRs should be regarded as an important activity for plantation of fodder trees on which the bulk of the livestock population depends.

Changing Scenario of Bovine Population in Himachal Pradesh

Brij Bala, R.K. Sharma and Virender Kumar†

An attempt has been made in the paper to study the changes in the composition of bovine and sheep population over a period of ten years (1982 and 1992) and to work out the trends in and composition of milk production in different districts of Himachal Pradesh. The data were collected from livestock censuses of Himachal Pradesh and *Statistical Outline of Himachal Pradesh.* The results of the study reveal that over the ten-year period there was an improvement in the cattle population. The share of improved breeds of cattle in the total cattle population has shown an increase whereas the population of local cattle decreased in the state. A similar trend was observed in all the districts of the state. The largest increase in improved adult male was observed in Bilaspur district (about two times) whereas Mandi district recorded an increase of more than three times in improved adult female population. Among young stock also the increase in improved cattle was found to be significant. The results showed that there was no improvement in buffalo breeds in the state since no separate data on improved buffaloes were available. The buffalo population has shown a positive trend over the period, being the highest in Shimla district (25 per cent) and the overall increase was estimated to be 13.64 per cent for the state. The tribal district, Lahaul and Spiti, had no buffalo population whereas in another tribal district, Kinnaur, its population was very low. The sheep population has shown a declining trend over the period under study. Again the population of improved breed has increased. The ratio of male to female population was estimated to be very low both for local and improved sheep. The goat population has marginally increased over a period of ten years.

The trends in milk production for cattle, buffaloes and goats have been worked out over a period of 15 years, which were estimated to be 8.23, 4.21 and 3.29 per cent per annum respectively. The contribution of buffalo milk to the total milk production was found to be the highest. The study has shown that although the number of improved breeds of bovine population has increased, still more efforts are needed to enhance the replacement of local breeds by improved breeds. For this veterinary services have to be strengthened in addition to providing regular supply of feed and fodder.

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Structural Changes in Draught Animal Power in Indian Agriculture

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An attempt has been made in the paper to analyse the structural changes in draught animal power in Indian agriculture and to ascertain the factors responsible for these changes. Specifically, the main objectives of the study are to study the changes (growth or decline) in draught animal power in India, across the size of holdings and regions, to find out the concentration of animals on different size-groups of holdings and in various states, and to estimate the functional relationship of draught animals with gross cropped area and number of tractors in various states of India. The data for the study were collected from various published sources.

The study showed that the total number of draught animals which was 67.38 million in 1951 decreased to 65.22 million in 1987. It increased continuously upto 1977 but decreased thereafter. Animal power per 100 hectares of sown area in India was the highest, being 25.85 pairs in the year 1966, which decreased to 19.20 pairs in 1987. The highest increase in the draught power was noted between 1956 and 1961 both in the number and per 100 hectares of area (13.80 and 8.97 per cent respectively). Since 1956 draught animals decreased at an increasing rate in Kerala while in Orissa their number increased at a decreasing rate. Total draught animal power decreased in Andhra Pradesh, Assam, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh during the decade of 1977-87. The decline in the number of draught animals was the highest in Kerala (60 per cent) while it was the lowest in Gujarat (2.4 per cent). The states where animal power increased during 1977-87 were Bihar, Himachal Pradesh, Jammu and Kashmir, Maharashtra, Orissa and West Bengal. The highest increase was noted in West Bengal (41 per cent) and the lowest in Orissa (1.1 per cent). Therefore, there was no uniform pattern of change among all the states of India. In some states it had increased while in others it decreased. The tractor power, on the other hand, a close substitute for draught power increased among all the states. All-India concentration ratios of cattle power increased (from 0.2294 to 0.2418) between the years 1981-82 and 1986-87 while the same decreased (from 0.2411 to 0.2082) for buffalo draught power during this period. In Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Rajasthan, Tamil Nadu and West Bengal the concentration ratio decreased showing more even distribution of cattle power while in states of Bihar, Haryana, Himachal Pradesh, Maharashtra, Orissa, Punjab and Uttar Pradesh it increased, indicating more uneven distribution of cattle power among different size-groups.

The tractor power coefficient was negative and significant in most of the states. R^2, the coefficient of multiple determination, varied from 0.16 in Karnataka to 0.97 per cent in West Bengal. The study showed that deceleration of draught animals was not uniform across the size of holdings and among the states. The decrease in the number of draught animals was faster where the percentage of high-yielding varieties area under crops was higher and better

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infrastructure of assured irrigation and transportation prevailed. Therefore, the farmers in all the states and various size-groups of holdings now have less draught animal power due to various economic reasons.

Growth and Development of Poultry in India - A Regional Study

S.P. Bhardwaj, R.K. Pandey and V.K. Mahajan†

In the livestock sector, poultry is the most efficient enterprise for increasing the supply of desired proteins, fats and vitamins in a very short period. Technological advances have revolutionised the role and structure of poultry in India. It has become one of the most specialised enterprises in many parts of the country. An attempt has been made in the paper to examine the growth of poultry and to analyse the regional disparity in the poultry production in India. The study indicated that there has been a massive growth in the improved parent stock and consequently in poultry production. It is also revealed that there exists regional disparity in the distribution of improved parent stock and poultry production. The factors responsible for this regional disparity in the poultry production were identified. The disparity in the prices of poultry products and the production of coarse grains in a region were found to be mainly responsible for imbalanced growth of poultry in India.

Composition and Utilisation of Draught Animal Stock according to Holding Size in Rajasthan

P.M. Sharma and K.A. Varghese*

The paper seeks to examine the rationale behind keeping of draught animals by assessing the magnitude and composition of farm draught animals along with the utilisation and surpluses available across farm size-classes in different agro-climatic regions of Rajasthan. The farm level study was carried out as a part of ICAR ad hoc scheme entitled "Survey of Animal Draught Power in Various Agro-Climatic Zones of the Country - Socio-Economic Features and Current Husbandry Practices." Multi-stage stratified random sampling method was followed to select 900 farm households, grouped into small (< 2 ha.), medium (2-6 ha.) and large (> 6 ha.) size-classes, from Barmer (zone I), Sikar (zone II), Jaipur (zone III), Banswara (zone IV) and Jhalawar (zone V) districts of the state during 1988-89.

When viewed over the regions, the number of draught animals per farm varied from 0.83 in arid western region to 2.47 in sub-humid southern part of the state. Though the number of draught animals per farm showed positive association with farm size-classes, when considered on per hectare basis an inverse relationship with farm size-classes was evident in all the regions. The inter-zonal differences in the per farm size of draught animals could be attributable to the species of animals and also to the factors such as soil type, cropping

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pattern, etc.

In the western arid region, a combination of bullock pairs and camels are being used. But in the south eastern sub-humid region, cattle are the major species. Young stocks are being maintained on the farm in all the regions for timely replacement of old stock and also for use at critical stages. The local breeds, befitting to the agro-climatic situation and which can withstand the climatic extremeness, are popular in different agro-climatic regions. The annual per farm utilisation of draught animal power varied from 452 hours in the western desert area to 1,042 hours in the eastern humid area. While crop-based activities in zone II accounted for 29 per cent of the utilisation of available supply, in the tribal dominant zone IV, 87 per cent of the total utilisation is accounted by crop-based activities. Transport activities are found to be the next important purpose for which draught animals are used in all the zones. Hiring the services of draught animal power is popular only in zone II. While only 18 per cent of the available supply was utilised in zone I, the utilisation rate was 30 per cent in zone II, 29 per cent in zone III, 24 per cent in zone IV and 32 per cent in zone V. It showed that a major part of available draught animal power remained unutilised in all the agro-climatic regions of the state. The low rate of utilisation when compared with regular maintenance cost is a matter of concern in all the zones. The animal power as a major source of draught power in the rural areas in the state is certain to continue in almost all the regions of the state. But there is a need to rationalise the number of draught animals to be maintained on the farms so that they are effectively and efficiently utilised for various purposes. This is all the more important in the context of the increasing trend in mechanisation in different regions of the state.

Economics of Livestock in relation to Watershed Management - A Case Study in a Shiwalik Foothill Village in Haryana

Swarn Lata Arya and J.S. Samra†

The study focuses on evaluating the impact of a watershed management programme on animal husbandry sector where no direct investment was made for livestock development. The study was undertaken in a typical Shiwalik foothill village called Bunga in Ambala district in Haryana state, where the livestock density is more than three times the national average. The results revealed that the closure of the forest area to grazing initiated a slow but steady regeneration of the hills. The limited supply of water from the dam enabled the villagers to step up cropping intensity from 100 to 186 per cent. The resultant increased availability of fodder both from the arable and non-arable lands, economic considerations, social compulsions and self-restraints brought about dramatic changes in the animal husbandry sector. Annual milk production in the village increased from 231 thousand litres in 1983-84 to 723 thousand litres in 1991-92. The decline in the number of goats by 233 per cent was particularly significant. The number of cows, buffaloes and bullocks increased by 47, 172 and 33 per cent respectively. The availability of green fodder from forest and field

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improved by 144 per cent, of dry fodder by 50 per cent and of concentrates by 95 per cent. Due to increase in feed and fodder availability the migration of buffaloes decreased by 51 per cent and of cows by 5 per cent. The impact of cattle migration on the village economy was also studied which indicated that villagers derived 25 per cent of their total income from migration activities which further helped in reducing income inequalities among the villagers. The benefit-cost ratio for 8 years (based on actual data from 1984-85 to 1991-92) at 12 per cent discount rate was 1.92 and for 15 years projected life was 1.81. The IRR was 21.2 per cent which showed that animal husbandry component was economically viable.

Dynamics of Milch Animal Population and Milk Production in Bihar

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The study examines the changes in milch animal population and milk production in different regions of Bihar during the period 1951-92. An attempt has been made to analyse the variation in herd size and milk production in different categories of households also. In Bihar, the livestock sector has emerged as the major constituent of state economy by contributing nearly 19 per cent to the state gross domestic product (1992-93). During 1951-92, there has been comparatively higher annual increase in buffalo population (12.22 per cent) than in cattle population (1.99 per cent). Moreover, the cow population declined by 1.63 per cent during the period. Among the three geographical regions, a relatively higher increase in buffalo population was observed in South Bihar than in North Bihar and plateau region. On the other hand, the increase in cow population was higher in plateau region during the period. In Bihar, the proportion of cows in milch animal population showed a declining trend from 75.89 per cent in 1951 to 64.41 per cent in 1992 whereas the proportion of she-buffaloes showed an increasing trend from 24.11 to 35.59 per cent during the same period. A similar trend was observed in plain regions of the state but the proportion of cows showed an increasing trend in plateau region. The number of cows and she-buffaloes per hundred human population declined respectively from 12.96 and 4.12 in 1951 to 5.02 and 2.95 in 1992. A similar trend was observed in North Bihar and plateau region. South Bihar also witnessed a decline in the number of cows per hundred human population during 1951-92 and for buffaloes only during 1951-61. The region witnessed increasing trend in the number of buffaloes per hundred human population from 3.90 in 1961 to 4.66 in 1992. Farm categorywise analysis of milch animal population indicated dominance of the buffaloes in milch animal herd; however, the proportion of buffaloes was comparatively higher in resource poor households (landless and marginal) than in resourceful households (big and small). About one-fourth of cow herd has been replaced by crossbred cows in land owning households whereas the performance of landless households has been much inferior (4 crossbreds in cow herd of 32).

Despite the increase in milk production, per capita availability of milk declined from

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133 grams per day in 1951 to 103 grams per day in 1992. The traditionally livestock rich region of North Bihar lagged much behind in milk production, per milch animal productivity and per capita milk production compared to South Bihar. Milch animal productivity was very low in the state (1.23 kg/day) but it was comparatively higher in small households than in other categories of households, probably due to their better land base and the adoption of improved livestock management practices. The study shows that there has been unbalanced growth in the population of milch animals and milk production in Bihar with respect to both the regions and categories of households. Hence, the livestock development programme targeting only the resource poor regions/households may be launched for balanced growth of the sector in the state.

Role of Co-operative Dairying and Its Impact on Resource-Poor Milk Producers in Uttar Pradesh

Ashwani Kumar Sharma†

Out of 10,000 and odd milk producers' co-operative societies functioning in the three-tier structure of co-operative dairying in Uttar Pradesh, about 25 per cent societies are defunct and not working. Of the functional ones, many milk co-operative societies are not able to procure adequate quantity of milk and thus are not economically viable. In addition, these societies are directed to support resource poor households like Integrated Rural Development Programme (IRDP) beneficiaries who are operating at an uneconomical scale and for whom it is very difficult to feed their milking cattle with concentrate feed and quality fodder. Moreover, in the wake of inadequate provision of milk enhancement services by Animal Husbandry Department, the coverage by milk co-operative societies in terms of percentage of villages covered as well as the percentage of dairy development beneficiaries covered remained quite low.

To assess the factors responsible for such low coverage, a survey of member producers particularly the rural landless households and marginal farmers was carried out to assess the overall impact of the functioning of milk co-operative societies with respect to generation of awareness and the provision of the milk enhancement services to their members. The awareness about the testing of milk by societies, the criteria for the price fixation, the recording and maintaining of records at the society level and holding of the meeting of the members was no doubt satisfactory (i.e., more than 60 per cent members were aware) but the position obtaining with respect to provision of milk enhancement services was not encouraging. Only 30 to 40 per cent of the members were in receipt of one or the other form of service being provided by the societies. Also very meagre impact was envisaged on the purchase of additional milch animals and in the increase in the overall supply of milk by member producers. The study reveals that the dairy co-operatives need to be organised on proper lines. The resource-poor households who are supported under IRDP, Jawahar Rozgar Yojana and also by dairy co-operatives need to be made operative at an economically viable scale, also by involving their female labour force. Only then these societies would be assured

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of the milk supply for their viable working and be able to meet out the fairly extensive competition the milk societies have to face with the traditional *dudhiyas* (village milk vendor).

Prospects of Raising Milk Production in Uttar Pradesh

P.P. Dubey, C. Sen and S. Narain*

An attempt has been made in the paper to examine the growth and prospects of milk production in Uttar Pradesh. The analysis of secondary information since 1961 reveals that both the number of milch animals and their productivity in the state increased consistently at linear rates. This rate of increase seems quite slow for such a longer span of time. The rate of increase in cow population (in milking stage) was relatively slower than that in buffalo population but the rate of increase in productivity of cow milk is relatively higher than that of buffalo. It in turn enhanced the milk production but not at an attractive rate. The reasons behind it are lack of upkeeping and management knowledge among the farmers, uneconomic size of dairy farms at farmer's level, under-feeding and lack of medical care, shrinking size of land holdings and grazing lands and inadequate marketing arrangements in the rural areas. To boost the milk production, the above defects need to be removed and co-operative dairy farming should be encouraged with an economic dairy size well integrated with crop farming. Livestock, being an important component of the economy, requires urgent attention so as to enhance the economic viability and sustainability of the farming system.

Growth Trends in Bovine Population in District Meerut, Uttar Pradesh

V. Prasad,† Arun Solanki* and S.M. Dingar†

An attempt has been made in this paper (i) to find out the trends in the growth rates of different categories of bovine population of 3 years and above age group during inter-census periods (1978-87) and (ii) to examine the factors affecting the trends in the growth rates of bovine population in Meerut district of Uttar Pradesh. The compound growth rate of bovine population as a whole showed a decreasing trend at -4.24 per cent per annum during 1978-87. Among bovine population, cattle and buffalo population recorded a negative growth rate of -8.96 per cent and -1.24 per cent per annum respectively during the same period. As regards the growth rate of draft and milch animals, on an overall basis, it was negative being -11.19 per cent per annum for draft animals and was positive being 5.59 per cent per annum for milch animals during 1978-87. The negative growth rate in draft animals was due to steady

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mechanisation of agricultural operations in the study area. The positive compound growth rate for milch animals suggests that during this period much attention was paid to increase the number of milch animals. It may be mentioned that dairying has emerged as a business proposition to the majority of the rural population of the study area. It was further observed that the growth rate for she-buffaloes was higher (5.71 per cent) than for cows (3.59 per cent), because of greater attention paid to the maintenance of she-buffaloes, due to higher milk yield, high fat content and high price of milk.

The main factors responsible for the decreasing trend in draft animals may be the replacement of animal power by tractor and other mechanical power while the increasing trend in milch animals was due to impact of establishment of District Co-operative Milk Union, availability of labour and fodder, organised marketing system and locational advantage of the district being nearer to Delhi, which provides a wide market for milk and other products. To make milk production enterprise more profitable, more attention needs to be paid to provision of various technical inputs including breeding, feeding, management, veterinary care, organised marketing system and credit facilities for acquiring quality breed milch animals.

India's Trade Experience in Livestock and Livestock Products

Kanchan Tewari*

India has one of the largest livestock populations in the world. Fifty per cent of the buffaloes and twenty per cent of the cattle of the world are found in India. An attempt has been made in the paper to examine the performance of the livestock sector in international trade from 1960 to 1989. In the early 1960s the share of livestock sub-sector in total export of agricultural commodities was only 0.29 per cent. In the total value of import of agricultural commodities, the share of the livestock products was only 0.53 per cent. By the end of the 1980s, the contribution of livestock and livestock products to total agricultural exports and imports increased to 4.92 per cent and 4 per cent respectively. India today has trade surplus in the case of these products. While live animals and meat and meat products have been able to make a dent in sustaining the tempo of increasing and diversifying agricultural trade, dairy products are yet to prove the same though the potential exists.

While the export of livestock and livestock products has grown faster than the rates at which total Asian or world exports of these products are rising, their imports into India have grown at a rate lower than the rates of Asia and the world. Further, a marked increase has been accomplished by India in terms of share in total export of livestock and livestock products in Asia and the world. The situation may further improve if more emphasis is laid on producing more of value added products of international quality standards and aggressive marketing strategies are adopted.

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Livestock Situation in India: A Spatio-Temporal Analysis

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The purpose of this paper is to study the changes in the size and composition of milch animal population and milk production and the trends in the number of draught animals and to identify the factors responsible for decline in the growth of draught power. The study is based on data relating to livestock population, milk production, agricultural population, total cropped area, agricultural machinery, area under high-yielding varieties and irrigation, etc., collected from various published sources. The results of the study revealed that the bovine population in the country increased by about 0.76 per cent per annum during the last three decades (1956-87) and most of this increase, however, took place between 1956 and 1961. The milch buffalo population has consistently grown faster (2.01 per cent per annum) than cows (0.97 per cent per annum). The steady rise in buffalo population as compared to cow population shows that farmers have shifted from cows to buffaloes as a source of milk. The possible reason for a relatively faster growth in buffalo population may be higher lactating efficiency, milk yield, quality of milk and feed conversion efficiency.

The ratio of milch animals to draught animals is generally higher and showed an increasing trend in all the states over time, which indicated a relatively faster growth of milch animals relative to draught animals. The ratio of cows to buffaloes showed a declining trend in a majority of the states, except in West Bengal, Orissa, Kerala and North-eastern states, where cow has always been the main source of milk production, the dominance of cow has become more pronounced over time. Therefore, the study indicated that the tendency of faster growth of milch animals relative to draught animals is nearly universal and buffaloes have substituted cows for milk production in a majority of the states.

The total milk production in the country has increased from 17.4 million tonnes in 1951 to 56.7 million tonnes in 1991 and buffaloes dominated the milk production scene contributing about 49 per cent of the total milk production in 1991. In spite of the increase in human population, the per capita availability of milk has increased from 132 grams in 1951 to 183 grams in 1991, but it is still below the minimum nutritional requirement in a majority of the states.

The study also revealed that the draught animal population was almost stagnant during 1961-87 and in fact declined during 1977-82 and 1982-87. The average area per pair of draught animals rose from 4.23 ha in 1956 to 4.74 ha in 1987. On the other hand, the mechanical power used in agriculture rose sharply during the same period. The results of functional analysis showed that as the intensity of machine input (in terms of number of tractors per hectare of cropped area) and agricultural development (represented by irrigated area) increased, the animal power per unit area declined. These results clearly demonstrated that animal power per unit land area is being substituted by mechanical power for various crop production operations.

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Demand for and Supply of Feed and Fodder Resources for Bovine Population in Himachal Pradesh

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Himachal Pradesh is a state of small land holders with meagre fodder resources for feeding their cattle. Traditionally, they preferred to keep small size animals which could be maintained at low level of feed resources. These animals are low milk yielders and to meet the milk requirement farmers keep large number of such animals, which compete for meagre feed resources, resulting in over-grazing and indiscriminate lopping. The pressure on land has also been increasing over time due to increasing human population. Grazing and pasture lands are being converted into arable lands. The increase in fodder area and productivity of such lands has not kept pace with increase in bovine population. Further, the State Department of Animal Husbandry has over the years launched a number of cattle improvement programmes. The success of these programmes is closely linked with feed and fodder availability. It was, therefore, considered appropriate to study the feed and fodder requirement and availability for the bovine population in different districts of the state and suggest ways and means to bridge the gap between demand for and supply of feed and fodder in the state. The basic districtwise information was collected from different sources for estimating the growth of bovine population, availability and requirement of feed and fodder for different periods (1972-1992). It was observed that bovine population in the state recorded an increase of 12 per cent between 1972 to 1992. The maximum increase was observed in the case of buffaloes (25 per cent). The growth rate in the bovine population during different inter-census periods varied from -4.17 to 3.35 per cent per annum. For females and buffaloes over 3 years of age, the growth rate varied from -3.71 to 5.91 per cent and from -4.74 to 8.66 per cent per annum respectively. Similar inter-district variations were observed in other categories of bovine population too.

The findings of the study have amply demonstrated that there existed an overall shortage of all types of feed resources and the existing resources were not sufficient to meet even the half of the requirements of bovine stock in certain districts. There was a colossal shortage of as much as 50 per cent of dry fodder, 21 per cent of green fodder and 94 per cent of concentrate in the state in 1972, whereas the corresponding estimated shortage for these feed stuffs by 2002 A.D. would be to the tune of 59, 37 and 93 per cent respectively. A similar pattern was also noticed in the different districts of the state. The gap between availability and requirement of feed resources for bovines will continue to exist and this would adversely affect the genetic potential particularly of crossbred cattle. This underlines the need for timely steps for better feeding and management aspects to increase the production efficiency of the animal population in future. Economy in the feed could also be effected by reducing the unproductive periods of life of the cattle, viz., the age till attainment of maturity and calving interval and this would shorten the dry periods of the animals. Also,

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the breed of the existing stock can be improved through crossbreeding. The production of straw and crop residue can be increased by adopting yield increasing technology of foodgrains. Fodder development is an important component of animal husbandry and its demand is always increasing with the increase in the animal population. Himachal has large areas under marginal and sub-marginal lands which can be diverted towards grasses and quick growing fodder trees suitable in the area. The level of pasture/grazing lands or *ghasinis* and wastelands need to be improved substantially for the introduction of suitable fodder plants/trees. The production of grasses in pasture/grazing lands needs to be improved through controlled grazing and introduction of better quality seeds and legumes. Fodder demonstrations should be set up on the farmers' field/*ghasinis* to encourage them to grow fodder/grass/trees on such lands. Improvement of grasslands, forests, wastelands and marginal lands will improve the overall environment, ease the pressure of bovine population and increase the farmers' incomes in the shape of animal products and reduce the gap between availability and requirement of feed resources in the state.

Spatio-Temporal Changes in Consumption of Livestock Products in India

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An attempt has been made in the paper to examine the variations in the pattern of consumer expenditure on milk and milk products and meat, eggs and fish in the important states between rural and urban sectors during the years 1965-66 to 1987-88. Nation-wide consumer expenditure surveys carried out periodically by the National Sample Survey (NSS) Organisation are the sources of the data. The data from the 20th Round of the NSS during 1965-66 and 43rd Round during 1987-88 have been used to analyse the changes in per capita consumption levels of milk and milk products and meat, eggs and fish. Cobb-Douglas type of production function was fitted to the data to study the relationship between per capita expenditure on milk and milk products and meat, eggs and fish and per capita total income per month (per capita total expenditure per month) to derive income elasticities of demand. The findings of the study reveal that the preference of the consumers for milk and milk products was higher in northern states and that for meat, eggs and fish in eastern and southern states in the rural areas. However, the consumer's preference for meat, eggs and fish has also been increasing in northern states. The findings are similar for the urban areas also. Even within rural and urban areas, the consumption pattern varied from region to region. The variations are due to differences in consumption habits and levels of income of the people in different regions of the country. Another important finding of the study is that people living in the rural areas are poorer than those in the urban areas and the consumption pattern of the masses in general is diversifying over the years.

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Temporal Changes in Size and Composition of Milch Animals in Haryana

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An attempt has been made in the paper to examine the temporal changes in the size and composition of milch animals in Haryana. The study is exclusively based on secondary data collected for the period 1966-88. From the analysis of the study, it was found that the livestock population in the state increased at an annual growth rate of 2.10 per cent during 1966-88. Though the population of all the categories of livestock increased during this period, the magnitude of increase differed in each category. The proportion of increase in buffalo population during 1966-88 was the maximum, followed by sheep. The cattle population, however, declined slightly during this period. The censuswise analysis also indicates that the growth rates were not uniform from one livestock census to another during this period. All the categories of livestock, barring cows, showed rapid increase during 1977-82 which maybe due to the Operation Flood Programme launched by the Government. Further, the decline in adult male cattle after 1977 may be due to the impact of mechanisation on agriculture.

The study further revealed that more than half of the total livestock population was accounted by buffaloes alone. Cattle population constituted about 29 per cent and sheep and goats 8.89 and 11.73 per cent respectively. It was also found that buffaloes were maintained mainly for milk production and the cattle for both draught and milk purposes. Moreover, crossbred cattle were reared mainly for milk production as adult males were less than one-third of the adult females. As regards the composition of milch animals, about 31 per cent of adult cattle and 59 per cent of adult buffaloes were in milk in Haryana in 1988. Furthermore, buffaloes in milk increased faster than cattle, thereby indicating the change in composition in favour of buffaloes which may be due to higher milk yield and economic returns from buffalo milk. The districtwise analysis indicates that the density in terms of livestock units per hectare of net sown area was higher for buffaloes than for cattle in all the districts of the state.

Productivity, Equity and Environmental Conservation Issues in Livestock Planning: A Study in Himachal Pradesh Himalaya

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In the Northwest hilly region there is need to tailor livestock development strategy to match the changing scenario in livestock sector and to raise the production base to higher and sustainable level. It necessitates careful identification and analysis of the problems

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confronting livestock sector to take appropriate policy action. The paper analyses the issues of productivity, equity and conservation in livestock planning in Himachal Pradesh. Specifically, it examines the changes in livestock population growth and composition and the relationship between farm size and livestock number and composition. Further, the dependence of livestock on environmental resources is examined to explain the repercussions on common property resources. This is followed by an analysis of livestock production efficiency and farm income inequality. The study is based on data collected from a sample of 300 farm households from four village clusters, representing the four agro-climatic zones of Himachal Pradesh, relating to the year 1988. It is concluded that for obtaining higher returns, proper breeding, feeding and weeding of livestock are urgently needed in the area under study. Reducing farm income inequalities, improving livestock productivity through improvement in quality and reduction in numbers, and meeting fodder requirements without degrading its source (i.e., natural resources base) are some of the major policy issues in livestock planning and management in Himachal Pradesh.

Role of Dairying as an Adjunct to Crop Husbandry in Andhra Pradesh

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A study was undertaken in Karimnagar district of Andhra Pradesh to analyse the economics, income and employment potential of dairy as a single enterprise and also as an adjunct to crop husbandry. Twenty landless farmers having dairy as the main enterprise and twenty each from small and marginal farmers were selected randomly in the study area for which data on cost of cultivation and maintenance cost of dairy were collected and analysed on per hectare and per milch animal basis.

The results indicated that the farmers in the study area obtained a net return of Rs. 10,549 from agriculture. The analysis also revealed that by maintaining one milch animal as an adjunct to crop husbandry and incurring an additional expenditure of Rs. 4,485 for cultivating one hectare of land the farmers would be in a position to derive an additional net return of Rs. 2,194, besides generating additional employment of 76 days or by 24 per cent of the total employment per year. Thus dairying plays a major role in augmenting the income as well as creating employment among the farming community. Further, an opinion survey revealed that a majority of the sampled farmers felt that transport is the main problem, followed by processing, storage and low productivity of milk.

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Role of Livestock in the Farm Economy of the Semi-Arid Region of Rajasthan

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The paper attempts to examine the contribution of livestock to the farm economy, based on data collected from a sample of 60 farmers in the four villages of Sikar district, a semi-arid region in Rajasthan during the agricultural year 1991-92. The selection of the district was done on purposive basis while tehsil, villages and farmers were randomly selected. The study revealed that the number of members in the family and the percentage of literacy increased with the increase in the size of holding. The average size of holding of small, medium and large farms was 1.40 ha, 2.90 ha and 7.43 ha respectively. The average number of animals kept on small farms was 7.80, on medium farms 7.75 and on large farms 14.90.

In all the size-groups of farms goats were the main animal species kept, followed by cows, sheep, buffaloes and bullocks. Of the total animals kept, goats accounted for 63.46 per cent, 68.38 per cent and 50 per cent on small, medium and large size-groups respectively. The number of animals per hectare decreased with the increase in the size of holding. It was 5.57 per ha on small farms and 2 per ha on large farms. However, the animals per family member was the highest (1.55) on large farms and lowest (1.10) on medium farms. Livestock contributed about 9 per cent of the total value of the operational assets. Its contribution was the highest on small farms (15.80 per cent) while its contribution was 7.78 per cent and 7.67 per cent on medium and large farms respectively. Per farm employment was about 310 days per year of which maximum employment (46.36 per cent) was provided by livestock activity, followed by crop farming (31.35 per cent), service (11.29 per cent), business (8.07 per cent) and hiring out labour (2.89 per cent). Across the size-groups, livestock also provided maximum employment. Of the total employment of 214.43 days on small farms, 279.13 days on medium farms and 430.13 days on large farms, the share of livestock was 50.22 per cent, 45.79 per cent and 45.40 per cent respectively. Thus employment in percentage terms decreased with the increase in the size of holding. Per worker employment provided by livestock activity in a year on small, medium and large farms was 32.63 days, 31.56 days and 40.68 days respectively.

The total annual income per farm in small, medium and large size-groups was estimated as Rs. 9,456, Rs. 8,941 and Rs. 19,547 respectively. Livestock contributed more than one-fourth of the total income on small and large farms while on medium farms it accounted for about 19 per cent of the total income. Service was the main source of income on small (34 per cent) and on medium (43.9 per cent) size-groups of holdings while on large size of holding business (40.36 per cent) was the main source of income. It is clear from the analysis that across size of holding livestock is the second source of income after service or business. Thus livestock plays a key role in determining the magnitude of farm asset values, employment and income in the semi-arid tract of Rajasthan.

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Changing Scenario of Livestock Economy in Uttar Pradesh

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Agriculture and animal husbandry sector contributes 42.5 per cent of the state income in Uttar Pradesh. The state has an important place in the livestock wealth of the country as about 14 per cent of the country's total livestock population is in Uttar Pradesh. The paper analyses the composition of and trends in livestock population at state and regional levels and also in the western region of the state. The number of cattle and buffaloes in the total livestock population of the state is observed to be 43.05 per cent and 29.82 per cent in 1988 against 53.20 per cent and 22.71 per cent in 1961 respectively. Though the population of buffaloes has increased at an appreciable rate since the early 1960s, the population of cattle has tended to stagnate in the state. The population of sheep, horse and pony, camel and yak has recorded a negative trend while the population of pig, donkey, mule and goat has been increasing appreciably. The successful launch of Operation Flood project resulting in commercialisation of dairy enterprise and increased mechanisation of agriculture may be the major factors responsible for the changing scenario of livestock wealth in Uttar Pradesh.

Regional analysis shows that except in eastern and Bundelkhand regions, the cattle population has declined in all the regions of the state. The western region has witnessed a higher proportion of buffaloes in total livestock population and has also the highest per-centage increase therein. Pig population has increased in hill, west and east Uttar Pradesh while mules population in hill and east Uttar Pradesh. The population of goats has been the maximum in the western region. Only the western and eastern regions recorded positive growth in the population of donkeys.

The study concludes that bullocks are being replaced by he-buffaloes to provide draught power for on-farm and off-farm activities in the rural areas of the state. The absorption of animal draught power has not declined in spite of increased farm mechanisation. There is only reallocation of tasks among mechanical power and animal power. While mechanical power is supplementing animal power in transportation, ploughing and tilling land, it is largely used in threshing and water lifting operations.

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