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ARTICLES

Livestock Production Systems in India: An Appraisal Across Agro-Ecological Regions

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I

INTRODUCTION

Livestock sector plays a significant role in the rural economy of India. It contributes about 5 per cent of the total gross domestic product (GDP) and one-fourth of the agricultural GDP (AgGDP). The sector is unique in terms of employment opportunities as two-third of female workforce in rural India is engaged in livestock rearing. Livestock is an integral part of mixed farming systems that characterise Indian agriculture. Livestock manure is the major source of nutrients for crop production and for sustaining soil fertility. Livestock wealth is more equitably distributed than that of land and the importance of livestock for the poorer households is even more. Besides, contributing food and inputs for crop production, livestock are important as savings or investments for the poor household and provide security or insurance through various ways in different production systems (Kitalyi *et al.,* 2005). Further, livestock rearing contributes to on-farm diversification and intensification, which could be one of the strategies for poor households to escape poverty and to maintain some stability in their earnings. The importance of livestock is much greater in marginal areas like arid and rainfed regions because of higher concentration of poor, limited benefits of green revolution technologies, climatic uncertainties, etc. However the nature of contribution of livestock has been changing over time and it varies from place to place. The analysis of livestock sub-sector at agro-ecoregional level would help in planning for livestock development based on resource endowments of the specific regions and will help in better targeting for region-specific intervention.

In this background the status of development of livestock has been assessed across different agro-ecoregions of India with the following broad objectives: (i) to examine the changes in the pattern of livestock population and status of intensification, (ii) to investigate the adoption pattern of crossbred/improved livestock species across different agro-ecoregions, and (iii) to identify the factors influencing farmers' decision to participate in livestock rearing.

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II

DATA AND METHODOLOGY

The paper uses data from diverse sources. District level data on livestock population were collected from *Livestock Census of 1992* and *2003*. The data on human population were taken from the human census carried out in 2001. The data on net cropped area and geographical area were collected from Directorate of Economics and Statistics, Ministry of Agriculture, Government of India. The analysis is carried out at regional level by aggregating the district level data. The importance of agro-ecoregional approach of agricultural development has been well documented. And in India a number of attempts have been made to delineate different agro-climatic regions of the country. The important contributions in this effort have been made by National Bureau of Soil Survey and Land Use Planning, Planning Commission, National Agricultural Research Project, and International Crops Research Institute for the Semi-arid Tropics. The National Centre for Agricultural Economics and Policy Research has also delineated and characterised the different agro-ecoregions of the country by incorporating the key elements of all the past approaches (Saxena *et al.*, 2001). Following this approach, the districts are categorised into five broad regions according to agro-climatic conditions and topography. These are: arid, coastal, hill and mountain, irrigated and rainfed regions. This delineation has been used and further modified in this paper as several districts came into existence afterwards. The list of districts in various agro-ecosystems are given in Annexure I. The rainfed region is the largest, covering 53 per cent of the country's geographical area, 60 per cent of the net cropped area (NCA) and 53 per cent of the gross cropped area (GCA). Lower share in GCA as compared to NCA may be attributed to lower cropping intensity because of lack of irrigation. It supports 45 per cent of human population and 55 per cent of livestock population. The irrigated region occupies the next position, followed by coastal, arid, and hill and mountain regions (Table 1).

TABLE 1. DISTRIBUTION OF LAND, HUMAN AND LIVESTOCK POPULATION ACROSS AGRO-ECOLOGICAL REGIONS

(per cent)

Regions* (1)	Human population (2)	Geographical area (3)	Net cropped area (4)	Gross cropped area# (5)	Livestock population (6)
Arid	3	9	8	8	3
Coastal	13	8	6	8	8
Hill and Mountain	4	14	3	2	6
Irrigated	35	15	23	29	28
Rainfed	45	53	60	53	55
All-India	100	100	100	100	100

Sources: Census of India, 2001; *Livestock Census of India, 2003* and Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

*Adapted from Saxena *et al.*, 2001; # Adapted from Birthal and Rao, 2004.

Changes in the pattern of livestock population, status of intensification and adoption pattern of crossbreeding/improved breeding technologies for different livestock species were assessed across different agro-ecoregions. Lack of district level reliable information for production and productivity of animals in terms of milk, meat, eggs, wool etc. constrained the further analysis. The coefficient of variation (CV) in the adoption of crossbred/improved animals among districts of each agro-climatic region was calculated to understand the potential that can be tapped with wider and accelerated diffusion of the existing technology and management practices, assuming uniformity of climatic conditions. The livestock rearing and factors affecting it were estimated by using household level data of 59th Round on situation assessment survey of farmers conducted in 2003 by the National Sample Survey Organisation (NSSO), Ministry of Statistics and Programme Implementation, Government of India. The survey was conducted in 2003 and provides valuable information on the socio-economic variables like household size, land holding, household type, social group, access to institutional credit, irrigation etc. These were used to explain livestock rearing at the household level.

A logit model was estimated to identify the factors, which influence rearing of livestock at the household level. The dependent variable is binary taking a value of 1 for the livestock rearing household, 0 otherwise.

$$P_i = E(Y = 1 | X_i) = 1/1 + e^{-(\beta_1 + \beta_i X_i)}$$

where P_i is the probability that Y =1, that is, the household rears livestock; X_is are the factors that influence household's decision to rear or keep livestock; e is the base of the natural logarithm, and β_is are the coefficients of the explanatory variables, X_is.

III

RESULTS AND DISCUSSION

Patterns and Trends in Livestock Population

As per the Livestock Census carried out in 2003, India had 185 million cattle, 98 million buffaloes, 124 million goats, 61 million sheep, 14 million pigs and 489 million poultry birds. Cattle always dominated the livestock production systems in India. The priority of maintaining a sufficient number of draught animals for use in crop production and transportation led to dual-purpose breeds of cattle that could produce milk and quality draught males. Other species like buffaloes, sheep, goats, pigs and poultry have been traditionally maintained for food production (Birthal and Taneja, 2006). However, the composition of cattle is changing in favour of milch animals largely because of increasing mechanisation of agricultural operations.

The distribution of major livestock species across agro-ecoregions are given in Table 2. Barring a few exceptions, the share of each region in major livestock has not changed during the last one decade, though the regional variations in concentration of different livestock species are clearly visible. As mentioned earlier, rainfed region supports the highest number of livestock units. Except buffalo and pigs, more than half of all livestock species (52.3 to 60.1 per cent) are concentrated in the rainfed region. Even 43.1 per cent of total buffalo and 44.7 per cent of pigs are reared in rainfed region. Irrigated region accounts for highest proportion of buffalo (43.4 per cent) and except sheep it accounts for second highest population of all other major livestock species.

TABLE 2. DISTRIBUTION OF MAJOR LIVESTOCK SPECIES ACROSS AGRO-ECOLOGICAL REGIONS

(per cent)

Species	Arid		Coastal		Hill and Mountain		Irrigated		Rainfed	
	1992	2003	1992	2003	1992	2003	1992	2003	1992	2003
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Cattle	2.9	2.7	9.2	8.0	7.5	6.9	21.2	22.3	59.3	60.1
Buffalo	3.5	4.2	9.2	6.0	3.5	3.2	40.0	43.4	43.9	43.1
Sheep	19.2	13.4	7.4	16.5	9.1	7.7	10.9	7.3	53.4	55.1
Goat	9.4	7.6	6.3	6.6	6.4	6.1	24.4	26.2	53.5	53.5
Pig	0.4	1.1	6.3	7.4	14.8	19.6	46.2	27.2	32.2	44.7
Poultry	0.2	0.2	17.6	23.6	9.6	6.3	18.3	17.6	54.3	52.3

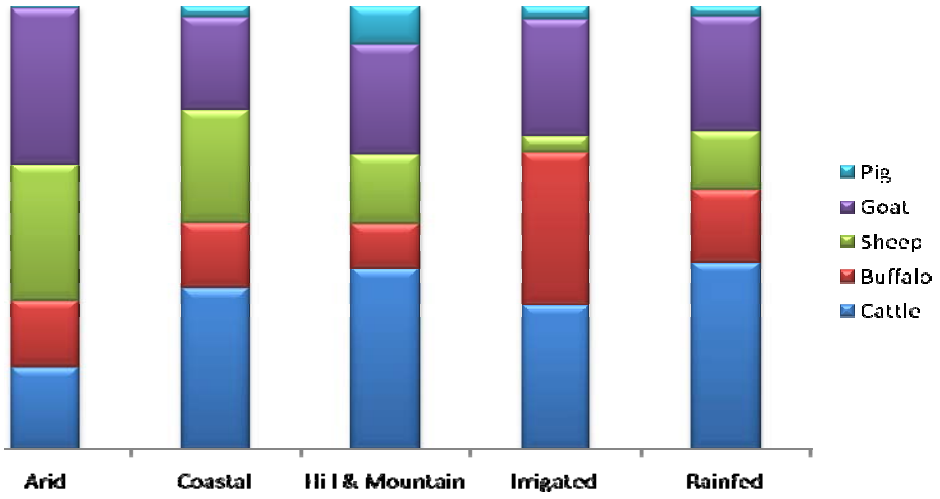
Source: Livestock Census of India, 1992 and *2003*.

Some interesting features have emerged in the changing dynamics of livestock population in different regions. The share of arid region in total population of sheep in the country has declined from 19.2 per cent to 13.4 per cent between 1992 and 2003. The coastal region registered a significant increase (more than double) in its share in sheep population from 7.4 per cent in 1992 to 16.5 per cent in 2003. This is a very interesting phenomenon and poses few questions, which need to be investigated further. Is it linked to deterioration of natural resources in the arid region or increasing meat demand in the coastal region inducing growth in sheep population? This region also registered significant increase in the share of poultry from 17.6 per cent in 1992 to 23.6 per cent in 2003. Andhra Pradesh and Tamil Nadu which comprise long coastal areas have emerged as the powerhouse of poultry production.

Hill and mountain system registered enhancement in its share of pig population and considerable decline in poultry. For other species, the share of hill and mountain regions has either slightly increased or stagnated. Similarly sharp contrasts were observed in irrigated region. Its share in pig population declined from 46.2 per cent in 1992 to 27.2 per cent in 2003 and in the case of sheep its share dropped from 10.9 per

cent to 7.3 per cent during this period. For other species the changes were not glaring. The rainfed region did not exhibit significant change in its share of livestock animals except in the case of pig. Its share in pig population increased from 32.2 per cent in 1992 to 44.7 per cent in 2003.

The composition of different species are shown in Figure 1. Goat and sheep dominate the livestock production system in the arid region. The coastal region is cattle dominated followed by sheep (Figure 1). The hill and mountain and rainfed region is dominated by cattle, followed by goats and sheep. Irrigated region is dominated by buffalo and cattle. Pig has substantial share in only hill and mountain region. The dominance of buffalo and cattle in irrigated region is understandable in view of the dependence of buffalo and cattle for feed on the crop by-products and residues, which is related to net sown area and irrigation, and also on account of the rising demand for milk associated with the rise in per capita income (Rao, 1994). This is also indicative of the concentration of these milch animals in relatively more productive and prosperous areas.



Source: Livestock Census of India, 2003.

Figure1. Composition of Livestock Species Across Agro-Ecological Regions

Trends in Livestock Density

Considerable variations have been observed in the composition of livestock in different regions and so is the case with the livestock density (Table 3). The density of cattle is the highest in irrigated region followed by rainfed region. In 1992 there were 90 cattle km^{-2} in this region which slightly declined to 83 in 2003. It is almost twice the cattle density in the coastal and hill and mountain regions and about five

times than that in the arid region. However, the ratio of livestock to human population is the highest in hill and mountain region.

TABLE 3. DENSITY OF LIVESTOCK IN DIFFERENT AGRO-ECOLOGICAL REGIONS IN 1992 AND 2003

	Arid		Coastal		Hill and Mountain		Irrigated		Rainfed		All-India	
Species	1992	2003	1992	2003	1992	2003	1992	2003	1992	2003	1992	2003
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
					(No. km^{-2}of geographical area)							
Cattle	18	18	68	54	28	27	90	83	63	63	58	56
Buffalo	10	15	31	22	6	7	78	88	21	25	26	31
Sheep	34	30	16	38	10	10	13	9	16	20	16	19
Goat	32	34	26	31	13	16	58	68	32	39	32	39
Pig	0	1	3	4	4	6	15	8	3	4	4	4
Poultry	2	4	192	433	53	66	115	177	85	150	85	153
TLU	31	35	100	82	35	32	165	162	84	89	84	87
					(No. per '000 human population)							
Cattle	217	169	174	106	357	279	158	111	289	236	235	175
Buffalo	121	141	80	43	76	71	137	118	98	92	108	95
Sheep	411	282	40	75	125	106	23	12	74	74	67	60
Goat	393	323	67	61	170	170	101	91	145	145	130	121
Pig	2	5	9	7	52	59	25	10	12	13	17	13
Poultry	25	36	493	848	677	687	202	238	390	558	346	475
TLU	373	332	255	161	444	364	289	218	386	332	342	271

Sources: Livestock Census of India, 1992 and *2003*; *Census of India, 1991* and *2001* and Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

The density of buffalo is also the highest in irrigated region and it has increased from 78 in 1992 to 88 in 2003. The buffalo density in rainfed and coastal region is almost the same which accounts near about one-fourth of the irrigated region. While the buffalo density has increased in rainfed region, the same has declined in the coastal region. The buffalo density in arid and hill and mountain region is very low. But unlike cattle, buffalo density has increased in all the regions except in coastal region between 1992 and 2003.

The density of sheep is the highest in coastal region followed by arid region. However, the density of sheep has increased in the coastal and rainfed region. In fact the coastal region registered a considerable increase in sheep density. In other regions the density of sheep either stagnated or declined. The density of sheep is the lowest in irrigated region. Goat density is again the highest in the irrigated region followed by rainfed region. It is the lowest in hill and mountain region. Density of pig varied from negligible to 8 km^{-2} in 2003. The density of poultry is the highest in coastal region, followed by irrigated region. Further, the density of poultry has increased considerably in all the regions.

Although wide regional variations have been observed in the species specific livestock population, in terms of standard livestock units (LU), livestock production system seems to be the most intensified in irrigated region, followed by rainfed and

coastal region. This is expected as there may be higher availability of feed, fodder and water in the agriculturally developed irrigated region. In terms of livestock units at the aggregate level, changing composition of livestock population seems to have been able to influence the speed of intensification and the livestock intensity seems to get stabilised or even declined. However, if it is viewed in terms of livestock per capita human population, a clear picture of declining livestock assets has emerged.

TABLE 4. ANNUAL COMPOUND GROWTH IN LIVESTOCK POPULATION IN DIFFERENT AGRO-ECOLOGICAL REGIONS BETWEEN 1992 AND 2003

(per cent)

Species	Arid	Coastal	Hill and Mountain	Irrigated	Rainfed	All-India
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cattle	-0.07	-0.79	-0.26	0.89	0.54	0.42
Crossbred	22.19	9.92	4.80	1.55	8.07	5.89
Male	16.78	4.10	0.77	-4.53	6.65	1.38
Female	23.39	11.49	6.75	4.23	8.47	7.50
Indigenous	-0.45	-2.70	-1.38	0.78	-0.06	-0.19
Male	-1.75	-1.97	-1.49	-0.13	0.00	-0.32
Female	0.10	-3.50	-1.26	1.66	-0.12	-0.07
Buffalo	3.69	-1.78	1.43	2.79	1.84	2.02
Male	2.42	-1.90	0.05	1.67	1.06	1.06
Female	3.85	-1.75	1.68	3.07	2.03	2.25
Sheep	-1.20	9.84	0.51	-1.61	2.39	2.09
Crossbred	45.93	19.11	4.85	-3.77	11.11	8.30
Indigenous	-2.45	9.56	-2.09	-1.43	2.11	1.65
Goat	0.42	2.90	2.01	3.13	2.44	2.44
Pig	9.70	2.09	3.19	-4.11	3.68	0.63
Crossbred	13.95	8.82	5.41	-7.50	11.02	3.05
Indigenous	9.42	1.02	4.46	-3.72	3.09	0.48
Poultry	5.83	9.04	2.12	5.73	5.78	6.14
Livestock Units	1.13	-0.45	0.17	1.51	0.99	0.97

Source: Livestock Census of India, *1992* and *2003.*

Growth trends in population of different species also support the above observations. Cattle population has declined in all the regions, but this decline is limited to the indigenous cattle only and mainly because of faster decline in the male population, whose role in agricultural operations has diminished considerably as a result of growing mechanisation of Indian agriculture. Among cattle the population of crossbred has increased at a considerably high rate in all the regions except irrigated region, indicating the substitution of low yielding inferior animals with high yielding improved animals. Rainfed region registered an annual growth of about 8.07 per cent in the crossbred cattle population. The buffalo population increased in all the regions except in the coastal region but its growth was slower than that of crossbred cattle except in the irrigated region. In rainfed region all livestock units except indigenous cattle registered positive growth and considerable growth were witnessed in the

crossbred population of different livestock species. These trends indicate that livestock production system is gradually stabilising. Chand (1995) in a study on livestock in Himachal Pradesh has also observed that the population of buffalo has been increasing at a faster rate than that of cattle and buffaloes and crossbred cows which were replacing indigenous cows maintained for milk purpose. The speed of intensification, which was perceived as a major concern for the sustainability of livestock production system, now does not seem to pose a challenge, though enhancing productivity of livestock animals still remains a major challenge.

Adoption of Crossbred/Improved Animals

Crossbreeding of indigenous stock with exotic animals is a well known strategy for improving the productivity of indigenous stock mainly of cattle, sheep, pigs and poultry. The strategy was mooted in India in the early part of the twentieth century, but could not be successfully implemented due to the fear of non-adaptability of crossbred animals to tropical Indian conditions (Rajapurohit, 1979). Later on, to cope up with the growing challenge of meeting the rising demand for livestock products, crossbreeding research and development efforts were re-introduced during the 1950s and concerted efforts, especially after 1970s have been made to promote crossbreeding technology. A number of crossbred strains of cow, sheep and pig are now available.

Table 5 indicates the share of crossbred animals in India. In cattle, crossbreds comprised 13.7 per cent in 2003, that nearly doubled from 7.7 per cent in 1992. During this period the proportion of crossbred sheep and pig increased from 4.9 and 12.4 per cent to 9.3 and 16.1 per cent respectively. In 2003 about half of the poultry were crossbreds. Regional variations in the adoption of crossbred technology are glaring. About one-fourth of the cattle were crossbred in the coastal and hill and mountain region. In irrigated region about 14.8 per cent cattle were crossbred in 2003, while in rainfed region it comprises 10.9 per cent. In arid region less than 5 per cent cattle were crossbred. In rainfed region the proportion of crossbred cattle doubled from 4.9 per cent in 1992 to 10.9 per cent in 2003.

TABLE 5. ADOPTION OF CROSSBRED/IMPROVED ANIMAL POPULATION ACROSS DIFFERENT AGRO-ECOLOGICAL REGIONS

per cent)

Regions/Species	Cattle		Sheep		Pig		Poultry
(1)	1992 (2)	2003 (3)	1992 (4)	2003 (5)	1992 (6)	2003 (7)	2003 (8)
Arid	0.5	4.6	0.2	13.2	5.0	7.6	58.0
Coastal	8.5	26.1	1.9	4.7	9.7	19.6	69.0
Hill and mountain	13.8	23.8	29.7	47.3	30.2	38.1	29.1
Irrigated	13.8	14.8	8.5	6.7	12.2	8.2	44.3
Rainfed	4.9	10.9	2.0	4.8	5.2	11.0	37.4
All-India	7.7	13.7	4.9	9.3	12.4	16.1	45.6

Source: Livestock Census of India, *1992* and *2003*.

In the irrigated region the proportion of crossbred cattle did not increase significantly; it may be partly attributed to higher base and preference for the buffalo milk as reflected in significant increase in the buffalo population. Regional variations are also clearly reflected in the adoption of crossbreds/improved breeds for other species. In the case of sheep, the maximum adoption of crossbreds were observed in hill and mountain region (47.3 per cent), followed by coastal region (13.2 per cent). Similarly, 38.1 per cent pigs were crossbred in hill and mountain region, in other regions it varied from 7.6 to 19.6 per cent.

The values of CVs in the crossbred adoption rates among districts of different agroclimatic regions revealed that in some districts with same agroclimatic environments, the adoption of crossbreds was even more than two hundred times higher than the average rate of adoption (Table 6). In general the higher CVs in the adoption of crossbreds were observed in the rainfed region. High values of CVs indicates the existence of considerably high untapped potential (Chandel and Malhotra, 2006).

TABLE 6. VARIABILITY IN ADOPTION OF CROSSBRED/IMPROVED ANIMALS IN DIFFERENT AGRO-ECOLOGICAL REGIONS IN 1992 AND 2003

(*CV in per cent)*

Regions	Cattle		Sheep		Pig		Poultry
	1992	2003	1992	2003	1992	2003	2003
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Arid	110.8	158.5	147.1	167.4	206.3	91.1	91.7
Coastal	160.1	91.9	195.0	214.2	178.0	110.4	79.4
Hill and mountain	101.3	90.4	143.2	119.4	127.3	97.4	79.5
Irrigated	133.4	108.6	156.4	159.2	115.8	118.3	55.9
Rainfed	188.9	158.5	243.4	230.7	157.7	150.1	88.3
All-India	160.1	126.0	206.9	182.7	166.8	135.5	78.5

Source: Livestock Census of India, 1992 and *2003.*

The average rate of adoption masks the magnitude of variations within the same region. Table 7 highlights the pattern of intra-regional variations in the adoption of crossbreds in different agro-climatic regions. The adoption of crossbred cattle in 41.4 per cent of the districts are less than 5 per cent, while in 31.7 per cent of the districts, the proportion of crossbred in total cattle was more than 20 per cent. The intra-regional variations are more striking in the arid and rainfed regions. For instance, in the rainfed region, less than 5 per cent cattle were crossbred in 2003 in 155 districts comprising 58.7 per cent of the total districts in the region. Only in 18.2 per cent of the districts, the percentage of crossbred cattle was more than 20 per cent. Intra-regional variations in the adoption of crossbred/improved are pervasive for all species except poultry. The pattern as well as the rate of adoption was different in the case of poultry.

TABLE 7. PATTERN OF ADOPTION OF CROSSBRED/IMPROVED ANIMALS IN INDIA ACROSS DIFFERENT AGRO-ECOLOGICAL REGIONS IN 2003

Adoption (per cent)	No. of districts					
	Arid	Coastal	Hill and mountain	Irrigated	Rainfed	All-India
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cattle						
>20	1 (6.7)	34 (53.1)	50 (48.5)	56 (37.3)	48 (18.2)	189 (31.7)
10-20	2 (13.3)	6 (9.4)	12 (11.7)	31 (20.7)	23 (8.7)	74 (12.4)
5-10	1 (6.7)	7 (10.9)	14 (13.6)	26 (17.3)	38 (14.4)	86 (14.4)
<=5	11 (73.3)	17 (26.6)	27 (26.2)	37 (24.7)	155 (58.7)	247 (41.4)
Sheep						
>20	4 (26.7)	10 (15.6)	44 (42.7)	30 (20.0)	34 (12.9)	122 (20.5)
10-20	Nil	6 (9.4)	7 (6.8)	17 (11.3)	13 (4.9)	43 (7.2)
5-10	Nil	4 (6.3)	8 (7.8)	19 (12.7)	15 (5.7)	46 (7.7)
<=5	11 (73.3)	44 (68.8)	44 (42.7)	84 (56.0)	202 (76.5)	385 (64.6)
Pig						
>20	Nil	27 (42.2)	56 (54.4)	35 (23.3)	30 (11.4)	148 (24.8)
10-20	3 (20.0)	7 (10.9)	8 (7.8)	39 (26.0)	39 (14.8)	96 (16.1)
5-10	5 (33.3)	11 (17.2)	4 (3.9)	32 (21.3)	53 (20.1)	105 (17.6)
<=5	7 (46.7)	19 (29.7)	35 (34.0)	44 (29.3)	142 (53.8)	247 (41.4)
Poultry						
>20	9 (60.0)	41 (64.1)	62 (60.2)	127 (84.7)	127 (48.1)	366 (61.4)
10-20	Nil	9 (14.1)	19 (18.4)	13 (8.7)	63 (23.9)	104 (17.4)
5-10	1 (6.7)	8 (12.5)	9 (8.7)	9 (6.0)	37 (14.0)	64 (10.7)
<=5	5 (33.3)	6 (9.4)	13 (12.6)	1 (0.7)	37 (14.0)	62 (10.4)

Source: Livestock Census of India, 2003.

Figures in parentheses indicate percentage to total number of districts in different regions.

Several technological, socio-economic and institutional factors influence the adoption of crossbreds. Since these differ across regions and districts, the adoption rate is also bound to differ. The population density, urbanisation, road density, feed availability, density of veterinary institutions have been found to be positively influencing the adoption of crossbred cattle in South Asia (Rao *et al.,* 2004). The role of access to credit, education, transaction cost in milk and quality of livestock delivery services were found to be important determinants in the adoption of crossbred cattle in Kenya and in case of small holders poor credit accessibility and bad road infrastructures were observed to delay the adoption (Baltenweck and Staal, 2000). Abdulai and Huffman (2005) observed that access to schooling, distance to the nearest local markets, credit availability, contact with extension agents and herd size had significant effect on adoption of crossbred cattle in Tanzania. Further, Yohannes *et al.,* (1993) reported that among social variables, education, experience, production knowledge and awareness and technical variables like productivity of cows, veterinary services and availability of land to grow feed or grazing area significantly influence adoption of crossbred cattle.

Feed and Fodder

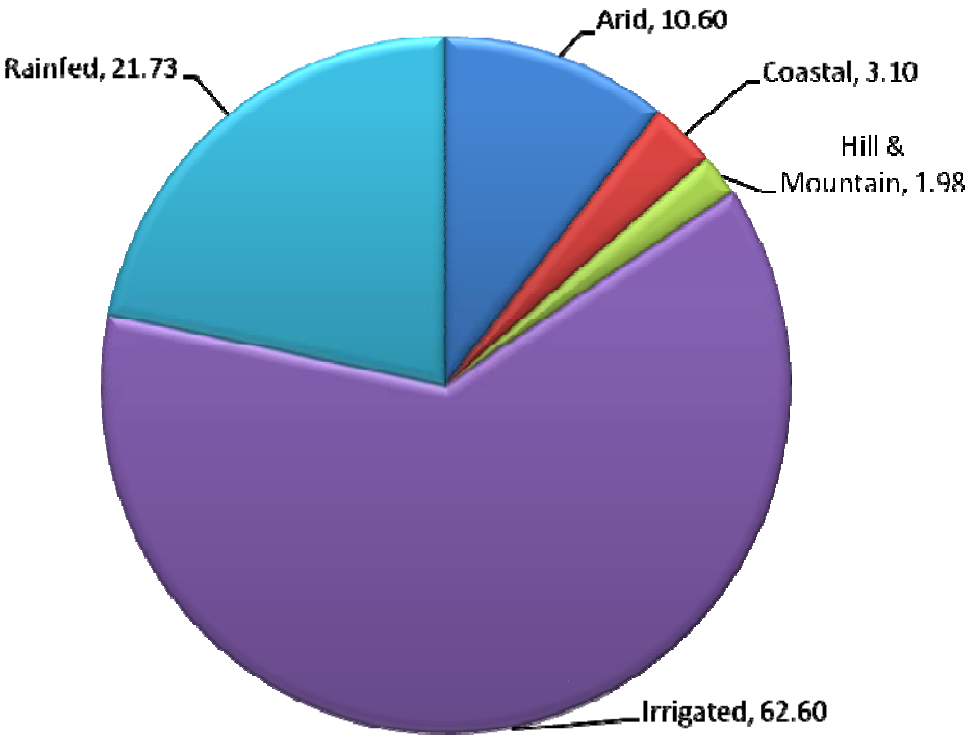
Adequate supply of feed and fodder is crucial to the growth of livestock sector. Livestock in India are fed largely on crop residues and byproducts and grazing lands. Cultivated fodders and gathered grasses are two important sources of green fodder supply. About 2 per cent of the gross cropped area in the country is allocated to fodder crops. But, regional variations in allocation of gross cropped area are glaring. Fodder area allocation in irrigated and arid region account for about 4 per cent of GCA, in other regions it hovers around 1 per cent (Table 8).

TABLE 8. AVERAGE AREA UNDER FODDER CROPS IN DIFFERENT REGIONS

Regions (1)	Average gross cropped area (ha) (2)	Area under fodder (ha) (3)	Share of fodder in GCA (per cent) (4)
Arid	3.66	0.14	3.82
Coastal	0.49	0.01	1.23
Hill and mountain	0.78	0.01	1.56
Irrigated	1.21	0.05	4.12
Rainfed	1.22	0.01	0.98
All-India	1.14	0.02	2.26

Source: Unit Level Data of NSSO, 54th Round, Common Property Resources, Sanitation and Hygiene, Services.

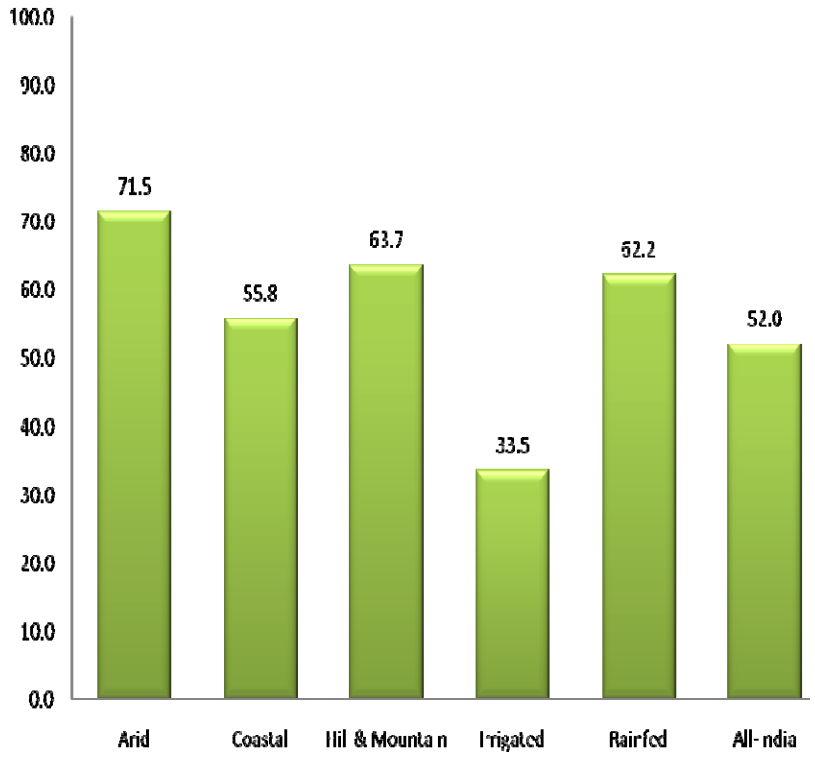
The situation in rainfed area is really a matter of concern. The farmers in this region allocate proportionately the lowest area to fodder cultivation, though the livestock density is only next to irrigated region. Rainfed region accounts for 22 per cent of fodder area of the country, while supporting 54 per cent of the livestock units (Figure 2). This imbalance may have serious implications on the sustainability of livestock production system and further aggravate the pressure on declining common property resources. The situation is further worsened as the area under fodder crops has remained more or less static during the last few decades. The gap between the demand and supply of fodder is increasing due to competing pressure on land, shift in acreage from cereals to other crops and diversified use of agricultural residues (Sharma, 2004). Concerted efforts need to be made for enhancing the availability of quality fodder through increasing the productivity of fodder per unit area, introduction of forage crops on fallow lands, community wastelands, grazing lands, etc.



Source: Unit Level Data of NSSO, 54th Round, Common Property Resources, Sanitation and Hygiene, Services.

Figure 2. Percentage Distribution of Fodder Area Across Different Agro-Ecological Regions

As a corollary to lower fodder cultivation, the dependence on common grazing lands, i.e., permanent pastures and grazing lands, wastelands, fallows excluding current fallows, etc., for fodder are considerably high particularly in marginal environment. This is clearly reflected in the use of grazing by farmers in different regions: 62 per cent farmers in the rainfed region graze their livestock units, while only about 34 per cent of farmers graze their animals in the irrigated region (Figure 3).



Source: Unit Level Data of NSSO, 54th Round, Common Property Resources, Sanitation and Hygiene, Services.

Figure 3. Percentage of Farmers Grazing Their Livestock Across Different Agro-Ecological Regions

In arid region 71.5 per cent of the farmers graze their livestock units. Again 12 per cent livestock farmers are landless and 43 per cent are marginal, who primarily depend on common property resources for grazing, which can have a bearing on environmental degradation. The available evidence indicates that common property resources have deteriorated quantitatively as well as qualitatively, which may act as a constraint for further livestock development particularly in rainfed region (Jodha, 1992). Therefore, further research is required on the socio-economic and policy issues which could address these complexities and also on technological interventions (Devendra *et al.*, 2005*)* to augment feed and fodder resources.

Determinants of Livestock Rearing

Livestock supplements to the livelihood of almost entire farming households in rural India. At aggregate level more than four-fifth of the rural farming households possess some species of livestock in India. However, there exists a considerable inter-

regional variation in the pattern of livestock species possessed by the farming households. The range of households having cattle varied from 43 per cent in coastal region to 68 per cent in the hill and mountain region (Table 9). The corresponding figures for buffalo varied from 18.6 percent in coastal region to 50.2 per cent in irrigated region. Half of the households in the arid region are rearing small ruminants, followed by hill and mountain region (31 per cent). For poultry the number of households rearing it varied from as low as 0.3 per cent in arid region to 30 per cent in the hill and mountain region.

TABLE 9. PERCENTAGE OF RURAL HOUSEHOLDS REARING DIFFERENT LIVESTOCK SPECIES: 2003

Regions/ Species (1)	Cattle (2)	Buffalo (3)	Sheep and Goat (4)	Poultry (5)	Other livestock (6)	All livestock species (7)
Arid	49.4	49.1	50.0	0.3	5.1	91.2
Coastal	43.0	18.6	11.1	25.6	2.7	68.1
Hill and mountain	68.1	27.1	31.1	30.0	6.4	85.3
Irrigated	48.0	50.2	19.9	7.6	9.0	81.4
Rainfed	64.0	27.9	25.7	21.5	7.2	80.4
All-India	56.1	35.4	23.1	16.8	7.3	80.1

Source: Unit Level Data of NSSO, 59th Round, *Situation Assessment Survey of Farmers*.

The farmers' decisions to keep livestock are influenced by a number of household factors and the surrounding socio-economic environment. In this section we examine the influence of such variables in the farmers' decision in keeping livestock by using household level data of NSSO 59th Round on situation assessment survey of farmers.

We estimated a logit model where the dependent variable is binary taking a value of 1 if a farmer rears livestock species, zero otherwise. The explanatory variables include farmer's experience, occupation, social group, land and labour endowments, access to credit, media etc. The results of logit regression are presented in Table 10. The family size has been taken as a proxy for availability of labour for rearing of livestock by the households. The coefficient of labour is positive and significant at less than one per cent for all types of livestock, which implies that sufficient availability of family labour facilitate the livestock rearing. Occupation of the household also has a significant role in the decision making for taking an enterprise. The coefficients for self-employed in non-agriculture, agricultural labour, other labours and other households were negative. These are negative with reference to households self-employed in agriculture. The labourers may face trade-off between allocation of their labour for wage earning and rearing livestock to supplement their household income. Further, other resource constraints may also discourage them to go for livestock rearing. The households whose primary occupation is agriculture would like to maximise their income by pursuing allied activities with main agricultural activities and livestock is the natural ally because of the overwhelming

mixed crop livestock production system in the region. Agricultural labourers are mainly hired for agricultural operations and livestock rearing primarily depends on family labour. They also gain comparative advantage of experience, skills and availability of agricultural by-products for livestock as feed and fodder.

The coefficient of age of the head is positive and significant in case of cattle and buffalo, which shows that farmer's experience positively influences the decision to keep cattle and buffalo. For other species the influence of age is not significant. Coefficient of the sex of household is positive and significant for cattle and buffalo rearing, implying that female headed households are less likely to rear cattle and buffalo, while female headed households prefer to rear small ruminants and poultry. In fact the rearing of small ruminants and backyard poultry have always been in the domain of female in India. The relationship between farm size and livestock rearing has been found positive and significant for cattle and buffalo rearing, which indicates the existence of strong crop-livestock interaction. However, the relationship between rearing of small ruminants and poultry was observed negative and significant. This is expected as with the increase of size of holding the availability of feed and fodder is expected to increase, which is crucial for cattle and buffalo rearing.

The negative relationship between land size and keeping of small ruminants and poultry confirm that these species are generally reared by marginal groups and they depend more on common property resources for meeting their fodder and feed requirement. Similarly, the coefficient of irrigation is positive and significant for cattle and buffalo and negative for small ruminants and poultry. This means assured irrigation by ensuring availability of fodders particularly green fodders induce farmers to keep large ruminants.

Access of farm households to institutional credit positively and significantly influences farmers' decision to rear buffalo. But its effect on rearing of small ruminants is negative, which seems counter intuitive. The access to institutional credit may induce small ruminant holders to shift to other lucrative enterprises. Its influence for other species is inconclusive. The credit to livestock sector is abysmally low, only 4 per cent of the total agricultural credit goes to livestock sector. The access to different information sources has different influence on farmers' decision to rear livestock. While the access to radio has a positive and significant effect, access to television is negative and significant may be because till date television might have not become a general source of information. It is most likely, particularly in the rural areas only that well-off section possesses television who are less likely to be engaged in livestock rearing. The effect of caste (general) has a mixed influence on the decision of livestock rearing. The agro-climatic conditions have also mixed influence on the decision of rearing of livestock at household level. For instance, buffalo rearing is preferred in irrigated region than any other regions, while households located in other regions are more likely to rear other livestock species.

TABLE 10. COEFF. FACTORS INFLUENCING FARMERS' DECISION TO KEEP DIFFERENT TYPES OF LIVESTOCK

	Cattle		Buffalo		Sheep and goat		Poultry	
Explanatory variables	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gender of the head of the household, Male =1, otherwise=0	0.51105**	0.05733	0.34935**	0.06971	0.17220*	0.07184	0.03717	0.07887
Age of the head of the household (years)	0.00297*	0.00119	-0.00090	0.00136	-0.00259	0.00137	-0.00036	0.00146
Literacy of the head of household, Literate=1, otherwise=0	-0.01641	0.03259	-0.11252**	0.03649	-0.24154**	0.03750	-0.04360	0.04234
Household size	0.13936**	0.00672	0.12422**	0.00719	0.07512**	0.00634	0.05730**	0.00704
Farm size (hectare)	0.12541**	0.01559	0.09072**	0.03540	-0.04701**	0.01406	-0.17184**	0.01715
Participation in training programme=1, otherwise=0	0.17586	0.14904	-0.20905	0.15622	0.34247	0.17549	0.51621**	0.16580
Access to Kisan Vigyan Kendra=1, otherwise=0	-0.17540	0.15963	0.14816	0.17313	0.11766	0.19665	-0.11016	0.18373
Access to extension worker=1, otherwise=0	-0.03511	0.06879	0.21089**	0.07305	-0.29104**	0.08118	-0.07915	0.07914
Access to television=1, otherwise=0	-0.22000**	0.05446	0.03609	0.06012	-0.27980**	0.06892	-0.27028**	0.06542
Access to radio=1, otherwise=0	0.28573**	0.04671	-0.26633**	0.05008	0.15320**	0.05501	0.63458**	0.05384
Access to input dealer=1, otherwise=0	0.06200	0.04990	-0.17039**	0.05544	0.00962	0.05789	0.28963**	0.06576
Access to other progressive farmers=1, otherwise=0	-0.10775*	0.04290	0.01480	0.04718	0.02181	0.04956	-0.10111	0.05588
Access to primary cooperative society=1, otherwise=0	0.08906	0.08503	0.29215**	0.09093	-0.06935	0.10349	-0.66112**	0.12375
Access to output buyers/food processors=1, otherwise=0	-0.12057	0.10386	-0.06194	0.11584	-0.03565	0.12620	-0.08475	0.12838
Member of registered farmer organisation=1, otherwise=0	0.08091	0.10715	-0.20370	0.11438	0.04666	0.11943	0.58134**	0.10941
Household like farming =1, otherwise=0	0.11358**	0.03117	0.27850**	0.03545	0.09811**	0.03648	0.23006**	0.04051

(Contd.)

TABLE 10 (*CONCLD.*)

Explanatory variables	Cattle		Buffalo		Sheep and goat		Poultry	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Access to institutional credit=1, otherwise=0	0.02704	0.03671	0.31556**	0.04296	-0.15052**	0.04402	-0.03350	0.04791
Per cent area under fodder cultivation	0.00495**	0.00184	0.03013**	0.00295	-0.00099	0.00226	-0.00993**	0.00332
Per cent area under irrigation	0.00097*	0.00040	0.00482**	0.00046	-0.00303**	0.00047	-0.00395**	0.00051
Social Group								
ST=1, otherwise=0	0.20545**	0.05298	-0.29701**	0.06284	0.84821**	0.05691	0.62030**	0.05543
SC=1, otherwise=0	-0.10242*	0.04792	-0.37842**	0.05859	0.48636**	0.05678	-0.30295**	0.06354
OBC=1, otherwise=0	-0.02068	0.03728	0.15842**	0.04089	0.29006**	0.04616	-0.58485**	0.04891
Household Type								
Self employed in non-agriculture =1, otherwise=0	-0.64946**	0.05333	-0.67497**	0.06393	-0.08600	0.06272	-0.07678	0.06785
Agricultural labour=1, otherwise=0	-0.57357**	0.04321	-0.63424**	0.05913	-0.23541**	0.05162	-0.19014**	0.05728
Other labour=1, otherwise=0	-0.46961**	0.06608	-0.41486**	0.08535	0.24354**	0.07251	-0.25694**	0.08727
Other household=1, otherwise=0	-0.58400**	0.06564	-0.30586**	0.08075	-0.46819**	0.08784	-0.11374	0.08536
Agro-ecological zones								
Arid=1, otherwise=0	-0.37686**	0.12250	-0.19054	0.15380	1.35880**	0.11494	-3.10517**	0.57973
Coastal=1, otherwise=0	0.02587	0.05555	-1.29658**	0.07337	-0.75507**	0.08244	1.39220**	0.07472
Hill & mountain =1, otherwise=0	0.93568**	0.05916	-0.47155**	0.07159	0.45919**	0.06670	1.21267**	0.07569
Rainfed=1, otherwise=0	0.67763**	0.04154	-0.66444**	0.04799	0.19811**	0.04865	1.07772**	0.06159
Constant	-1.40788**	0.09594	-1.55988**	0.10691	-1.74503**	0.11310	-2.32724**	0.12806
Chi-squared	2024.43		2497.29		1157.90		2002.79	
Log-likelihood	-28586.55		-25577.15		-23189.16		-18552.26	
Number of observations	45519		45519		45519		45519	
R^2	0.08110		0.12940		0.05650		0.11480	

Source: Unit Level Data of NSSO, 59th Round, Situation Assessment Survey of Farmers.

Note: * and ** indicates level of significance at 5 and 1 per cent, respectively.

IV

CONCLUSIONS AND POLICY IMPLICATIONS

An attempt has been made in this article to assess the livestock profiles and their changing dynamics across different agro-ecoregions of India. The livestock composition has changed in favour of milch animals and the percentage of crossbred/improved animals has been increasing. Wide regional diversities have been observed in the adoption of crossbreed/improved cattle. The imbalance in the concentration of livestock and availability of fodder resources in different regions is clearly visible and hampering the prospects of livestock development in different regions, which is a major source of livelihood for the landless, marginal and small farmers. There is clear need to augment feed and fodder resources to keep the process of livestock growth going. Concerted efforts have to be made to arrest deterioration of common property resources through legal, social and institutional means. Several socio-economic factors have been found to have influence on the households decision to keep livestock. The expansion of area under irrigation and fodder cultivation is particularly important for rearing of cattle and buffalo. The potential for increasing proportionate area under cultivation seems to be limited in view of the primary food security concerns and the dependence of the livestock for its feeding requirement has be mainly on crop residues. Thus, the qualitative and quantitative improvement in the crop residues assumes importance for further growth and development of livestock sector.

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ANNEXURE I

LIST OF DISTRICTS IN VARIOUS AGRO-ECOLOGICAL REGIONS

AER (1)	State (2)	District (3)
Arid	Gujarat	Banaskantha, Jamnagar, Katchch, Rajkot
	Rajasthan	Barmer, Bikaner, Churu, Jaisalmer, Jalore, Jhunjhanu, Jodhpur, Nagaur, Pali, Sikar, Sirohi
Coastal	Andaman & Nicobar	Andaman, Nicobars
	Andhra Pradesh	East Godavari, Guntur, Krishna, Nellore, Prakasam, Srikakulam, Vishakhapatnam, Vizianagaram, West Godavari
	Dadra & Nagar Haveli	Dadra & Nagar Haveli
	Daman & Diu	Daman, Diu
	Goa	North Goa, South Goa
	Karnataka	Dakshin Kannada, Udupi, Uttar Kannada
	Kerala	Alapuzzah, Ernakulam, Iddukki, Kannur, Kasargode, Kollam, Kottayam, Kozhikode, Mallapuram, Pallakd, Pathanamthitta, Thiruvanathapuram, Thrissur, Wayanad
	Lakshyadeep	Lakshyadeep
	Maharashtra	Greater Mumbai, Raigad, Ratnagiri, Sindhudurg, Thane
	Orissa	Balasore, Bhadrak, Cuttack, Gajapati, Ganjam, Jagatsinghpur, Jajpur, Kendrapara, Khurda, Nayagarh, Puri
	Pondicherry	Karaikal, Mahe, Pondicherry, Yaman
	Tamil Nadu	Chennai, Cuddalore, Kancheepuram, Kanyakumari, Nagapattinam, Ramanathapuram, Thanjavur, Thiruvallore, Thiruvarur, Villupuram
Hill and Mountain	Arunachal Pradesh	Changlang, East Kamang, East Siang, Kurung Kurmey, Lohit, Lower Dibang Valley, Lower Subansiri, Papumpare, Tawang, Tirap, Upper Dibang Valley, Upper Siang, Upper Subansiri, West Kameng, West Siang
	Assam	Cachar, Hailakandi, Kabi-Anglong, Karimganj, N.C.Hills
	Himachal Pradesh	Bilaspur, Chamba, Hamirpur, Kangra, Kinnaur, Kullu, Lahaul and Spiti, Mandi, Shimla, Sirmaur, Solan, Una

(Contd.)

AER (1)	State (2)	District (3)
	Jammu and Kashmir	Anantnag, Baramula, Budgam, Doda, Jammu, Kargil, Kathua, Kupwara, Leh, Poonch, Pulwama, Rajauri, Srinagar, Udhampur
	Manipur	Bishnupur, Chandel, Churachandpur, Imphal East, Imphal West, Senapati, Tamenglong, Thoubal, Ukhrul
	Meghalaya	East Garo Hills, East Khasi Hills, Jaintia Hills, Ri Bhoi, South Garo Hills, West Garo Hills, West Khasi Hills
	Mizoram	Aizawl, Champhai, Kolasib, Lawngtlai, Lunglei, Mamit, Saiha, Serchhiip
	Nagaland	Dimapur, Kiphire, Kohima, Longleng, Mokokchung, Mon, Peren, Phek, Tuensang, Wokha, Zunheboto
	Sikkim	East Sikkim, North Sikkim, South Sikkim, West Sikkim
	Tripura	Dhalai, North, South, West
	Uttaranchal	Almora, Bageshwar, Chamoli, Champawat, Dehradun, Nainital, Pauri, Pithoragarh, Rudraprayag, Tehri, Udhamsingh Nagar, Uttarkashi
	West Bengal	Darjeeling, Jalpaiguri
Irrigated	Bihar	Arwal, Aurangabad, Banka, Begusarai, Bhagalpur, Bhojpur, Buxer, Darbhanga, East Champaran, Gaya, Gopalganj, Jehanabad, Jamui, Kaimur (Bhabua), Khagaria, Lakhisarai, Madhepura, Madhubani, Munger, Muzaffarpur, Nalanda, Nawada, Patna, Purnia, Rohtas, Saharsa, Samastipur, Saran, Sheikhpura, Siwan, Vaishali, West Champaran
	Chandigarh	Chandigarh
	Delhi	Delhi
	Haryana	Ambala, Bhiwani, Faridabad, Fatehabad, Gurgaon, Hisar, Jhajjar, Jind, Kaithal, Karnal, Kurukshetra, Mohindergarh, Panchkula, Panipat, Rewari, Rohtak, Sirsa, Sonepat, Yamuna Nagar
	Punjab	Amritsar, Bathinda, Faridkot, Fatehgarh Sahib, Firozpur, Gurdaspur, Hoshiarpur, Jalandhar, Kapurthala, Ludhiana, Mansa, Moga, Muktsar, Nawan Sahar, Patiala, Ropar, Sangrur
	Rajasthan	Alwar, Bharatpur, Hanumangarh, Jaipur, Shri Ganganagar
	Uttar Pradesh	Agra, Aligarh, Allahabad, Ambedkar Nagar, Auraiya, Azamgarh, Baghpat, Bahraich, Balia, Balrampur, Barabanki, Bareilly, Basti, Bijnor, Budaon, Bulandshahar, Chandauli, Chitrakut, Deoria, Etah, Etawah, Faizabad, Farrukhabad, Fatehpur, Firozabad, Gautambuddha Nagar, Ghaziabad, Ghazipur, Gonda, Gorakhpur, Hardoi, Jaunpur, Jyotibaphule Nagar, Kannauj, Kanpur Dehat, Kanpur Sahar, Kaushambi, Kheri, Kushinagar, Lucknow, Mahamayanagar, Maharajganj, Mainpuri, Mathura, Mau, Meerut, Mirzapur, Moradabad, Muzaffarnagar, Pilibhit, Pratapgarh, Raebareli, Rampur, Saharanpur, Shajahanpur, Shrawasti, Siddhartha Nagar, Sitapur, Sonbhadra, St. Kabir Nagar, St.Ravidas Nagar, Sultanpur, Unnao, Varanasi
	Uttaranchal	Haridwar
	West Bengal	24 Parganas(N), 24 Parganas(S), Birbhum, Burdwan, Hooghly, Howrah, Kolkata, Malda, Murshidabad, Nadia
Rainfed	Andhra Pradesh	Adilabad, Anantpur, Chittoor, Cuddapah, Hyderabad, Karimnagar, Khammam, Kurnool, Mahboobnagar, Medak, Nalgonda, Nizamabad, Rangareddy, Warangal
	Assam	Barpeta, Bongaigoan, Darrang, Dhemaji, Dhubri, Dibrugarh, Goalpara, Golaghat, Jorhat, Kamrup, Kokrajhar, Lakhimpur, Morigaon, Nagoan, Nalbari, Sibsagar, Sonitpur, Tinsukia
	Bihar	Araria, Katihar, Kishanganj, Sheohar, Sitamarhi,Supaul

(Contd.)

AER (1)	State (2)	District (3)
	Chhattisgarh	Ambikapur, Bilaspur, Dantewada, Dhamtari, Durg, Jagdalpur, Janjgir(Champa), Jashpur, Kabirdham, Kanker, Korba, Koriya, Mahasamund, Raigarh, Raipur, Rajnandgaon
	Gujarat	Ahmedabad, Amreli, Anand, Bharuch, Bhavnagar, Dahod, Dangs, Gandhinagar, Junagadh, Kheda, Mahesana, Narmada, Navsari, Panchmahal, Patan, Porbandar, Sabarkantha, Surat, Surendranagar, Vadodara, Valsad
Rainfed	Jharkhand	Bokaro, Chatra, Deoghar, Dhanbad, Dumka, E.Singhbhum, Garhwa, Giridih, Godda, Gumla, Hazaribagh, Jamtara, Koderma, Latehar, Lohardaga, Pakur, Palamau, Ranchi, Sahebganj, Saraikela, Simdega, W.Singhbhum
	Karnataka	Bagalkote, Bangalore Rural, Bangalore Urban, Belgaum, Bellary, Bidar, Bijapur, Chamarajanagar, Chikmagalore, Chithradurga, Davanagere, Dharwad, Gadag, Gulbarga, Hassan, Haveri, Kodagu, Kolar, Koppal, Mandya, Mysore, Raichur, Shiomaga, Tumkur
	Madhya Pradesh	Anuppur, Badwani, Balaghat, Betul, Bhind, Bhopal, Bidisha, Chhatarpur, Chhindwara, Damoh, Datiya, Dewas, Dhar, Dindori, Guna, Gwalior, Harda, Hoshangabad, Indore, Jabalpur, Jhabua, Katni, Khandwa, Khargone, Mandla, Mandsour, Murena, Narsinghpur, Neemach, Panna, Raisen, Rajgarh, Ratlam, Rewa, Sagar, Sahdhol, Satna, Sehor, Seoni, Shajapur, Sheopur, Shivpuri, Sidhi, Tikamgath, Ujjain, Umaria,
	Maharashtra	Ahmednagar, Akola, Amaravati, Aurangabad, Beed, Bhandara, Buldhana, Chandrapur, Dhule, Gadchiroli, Gondiya, Hingoli, Jalgaon, Jalna, Kolhapur, Latur, Nagpur, Nanded, Nandurbar, Nashik, Osmanabad, Parbhani, Pune, Sangli, Satara, Solapur, Wardha, Washim, Yavatmal,
	Orissa	Angul, Balangiri, Bargarh, Boudh, Deogarh, Dhenknal, Jharsuguda, Kalahandi, Kandhamala, Keonjhar, Koraput, Malkanagir, Mayurbhanj,Nawarangpur, Nuapada, Rayagada, Sambalpur, Sonepur, Sundargarh
	Rajasthan	Ajmer, Banswara, Baran, Bhilwara, Bundi, Chittorgarh, Dausa, Dholpur, Dungarpur, Jhalwar, Karauli, Kota, Rajsamand, Sawai Madhopur, Tonk, Udaipur
	Tamil Nadu	Coimbatore, Dharmapuri, Dindigul, Erode, Karur, Krishnagiri, Madurai, Namakkal, Perambadur, Pudukottai, Salem, Sivagangai, The Nilgiris, Theni, Thiruvannamalai, Thoothukudi,Tirunelveli, Trichirapalli, Vellore, Virudhunagar
	Uttar Pradesh	Banda, Hamirpur, Jalaun, Jhansi, Lalitpur, Mahoba
	West Bengal	Bankura, Coochbihar, Dakshin Dinajpur, Midnapore East, Midnapore West, Purulia, Uttar Dinajpur