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Impact Assessment of Non-Physical Determinants of Agriculture on the Structure of Milch Animals in the Thar Desert of Rajasthan

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Abstract

In the Thar Desert of Rajasthan, animal husbandry is not merely a subsidiary occupation to agriculture but also it is a major economic activity, providing the much needed insurance against prominantly occuring scarce conditions. In recent decades, Non-physical determinants of agriculture such as landuse and cropping pattern, irrigation and mechanization have transformed the structure of milch animals in this region. Therefore, the present paper is an attempt to be fruitful to assess the structural changes of livestock in the Thar Desesrt with geographical point of view.

Keywords: Non-physical Determinants of Agriculture, Milch Animals, Structural changes.

1. Introduction

Livestock rearing is the major component of arid agriculture enhancing the economic viability and sustainability of farming systems particularly in arid areas. In Thar Desesrt, livestock farming essentially works as an insulating factor against vagaries of droughts and famines providing a kind of stability and sustenance livelihood to the rural poor (Economic Review, 2013-14). In the study area, indigenous cows are being replaced by hybrid cows and buffaloes as they yield less quantity of milk and also decline in the demand of animal power in agricultural sector. The variation in the growth rates of milch animals indicates their relative significance and structural changes. Notable compositional changes are increase in the share of buffaloes and goats and consequent reduction of cattle and sheep. The composition of cattle and buffaloes has surely been moving in favour of increasing milk yield (Singh, Alam, 1983).

2. Study Area

The Thar Desert of Rajasthan is endowed with drought hardy milch breeds and some famous draught breeds of animals. There are some of the favourable conditions for animal rearing such as perennial grasses, vast grazing land, commercialization of dairy industry etc. (Shukla S.K. and Brahmankar S.D., 1992). The Thar Desert of Rajasthan is located between 24°31' to 30°12' north latitudes and 69°15' to 76°42' east longitudes by covering an area of 196,750 sq km (61 percent) of the State. Its length is 640 km from north to south and width is 300 km from east to west (Sharma, H.S., 2010). It includes 12 districts- Sriganganagar, Hanumangarh, Churu, Sikar, Jhunjhunun, Bikaner, Nagaur, Jodhpur, Barmer, Jalore, Pali, and Jaisalmer. The climate of the region is characterized with large variations in temperature, extreme dryness and scanty rainfall. The rainfall is highly erratic and unpredictable. Most of the rainfall (85 per cent) is received during monsoon (June-September) and co-efficient of variability ranges from 40-60 per cent and high evaporation (1500-2000 mm/year) in comparison to low rainfall causes severe aridity.

3. Objective of the Study

The study is aimed to examine the impact of agricultural patterns on structural changes of milch animals.

4. Hypothesis

The decline in demand of draught animals with low milk yield and short lactation period of indigenous cows due to change in landuse and cropping pattern, expansion of irrigation and mechanization of agriculture

are the factors responsible for structural changes of milch animals in the study area.

5. Methodology

The primary data have been collected from 60 sample villages during 2012-13. Ten households from each village and urban centres have been taken for field survey. The primary data and information are based on a schedule containing number and breeds of milch animals, their feeding cost and milk yield, land use classification, cropping pattern, irrigated area, views about structural changes and problems of animal rearing. Whereas the secondary data have been obtained from various published and unpublished reports and periodicals of Department of Animal Husbandry, Rajasthan, Jaipur; Central Arid Zone Research Institute (CAZRI), Jodhpur; Fodder Research Institute, Bikaner; Directorate of Economics and Statistics, Govt. of Rajasthan, Jaipur; and Rajasthan University of Veterinary and Animal Sciences, Bikaner.

The primary data along with the secondary data have been analyzed through tabulation, charts, maps and diagrams to conclude the study. The outcome of the study would be useful for the planners in policy making for improvement of livestock.

6. Non-Physical Determinants of Animal Rearing

The varying physical conditions are indeed responsible for variations in regional patterns of agricultural phenomena. However, the differential degree of combinations in institutional, biotechnological, operational, cultural and infrastructural factors influencing agricultural patterns must be considered useful. This is because the combination of these circumstances furnish the basic material needed for explaining the modifications brought in agricultural activities which otherwise are primary creation of natural factors. Therefore, their discussion is unavoidable to comprehend the varying levels of agricultural development as well as animal husbandry from place to place at point of time (Singh Jasbir and Dhillon S. S., 1984).

(i) Landuse Pattern

The data given in the table 1 shows comparative land use of the study area. In the year 1960, the forest cover was only 0.78 per cent which has increased by 2.5 per cent in 2000 and 3.80 per cent in the year 2014. It is lower than that of the State (8.02 per cent). But it is important to note that land not available for cultivation, fallow lands, cultivable wasteland and pastures show a declining trend in the Thar Desesrt as well as in the State.

It is very interesting to note that net sown area has increased from 39.50 per cent in 1960 to 51.56 per cent in 2000, 53.85 per cent in 2010 and 55.20 per cent in 2014. It has increased by about 1.5 times during 1960-2010. It indicates that the land use pattern of the study area is changing gradually resulting shrinkage of the lands available for animal grazing.

Table 1
Thar Desert of Rajasthan- Land use Classification (1960-2014)

(per cent)

Year	Forest	Not Available for Cultivation	Fallow Land	Cultivable Wasteland & Pastures	Net Sown Area
1960	0.78	14.28	19.41	26.03	39.50
1970	0.78	14.45	14.50	25.54	44.73
1980	1.36	8.25	14.18	28.77	47.44
1990	1.86	8.55	13.67	26.36	49.56
2000	2.50	8.72	13.15	24.07	51.56
2010	3.34	8.90	12.56	21.85	53.56
2014*	3.80	9.20	10.50	21.30	55.20

Source: Economic Review 2013-14, Govt. of Rajasthan, Jaipur *estimated figure

(ii) Cropping Pattern

Since the introduction of canal and tube-well irrigation, farmers prefer commercial crops rather than fodder crops. There was dominance of pastures, grazing lands and area under fodder crops till early eighties. The area under fodder crops was 56 per cent in 1951, has reduced to 47 per cent in 1992-93 and about 24 per cent in 2013-14. The area under oil-seeds cultivation increased from 6.2 per cent in 1951 to 28.2 per cent in 2013-14. The overall area under fodder crops (food-grain and pulses) decreased from 77 per cent to 34 per cent during the same period. The trend has resulted low production of feed and fodder causing their shortage for animals in the study area.

(iii) Expansion of Irrigated Area

The irrigated area by all sources was only 9.3 per cent in 1951 has increased by about 46 per cent in 2009-10 out of the total potentiality (53 per cent) of irrigation in the study area. This expansion of irrigation has resulted inclusion of new lands which were earlier under fallow lands, pastures and grazing land and land not available for cultivation and further it caused shrinkage of pastures and grazing lands.

(iv) Mechanization of Agriculture

Most of the farmers (84.6 per cent) prefer tractor in place of ox or camel in the study area. More significantly, tractorisation has reversed the traditional pattern of ownership of these draught animals. Presently, large farmers own more draught power per hectare than the small farmers. On the other hand, the availability of tractors on hire has helped small farmers to reduce the cost of draught power. The shift from labour-intensive animal power to capital-intensive technology has important socio-economic implications in the study area.

The number of tractors has increased by 14 times during 1983 (24,146) to 2014 (3.38 lakh). The growth in the number of oil-engines and electric pump-sets is far more impressive than that of tractors. The number of oil-engines increased from 1.95 lakh in 1983 to 4.27 lakh in 2003, and 10.35 lakh in the year 2014. During this period the availability of oil-engines (5.30 times), electric-pumps (9.5 times), cultivators (35.11 times) and threshers (25.47 times) has increased tremendously (table 2).

Table 2
Thar Desert of Rajasthan- Mechanisation of Agriculture
(in lakh)

Year	Cropped Area (hac)	Tractors	Oil Engines	Electric Pumps	Cultivators	Threshers
1983	1.23	0.24	1.95	1.32	0.09	0.34
1997	1.13	0.78	2.78	2.02	0.28	0.66
2003	1.28	0.96	4.27	3.84	0.86	1.16
2007	1.31	1.22	7.43	5.02	1.45	3.05
2010	1.55	1.67	9.55	8.15	2.32	6.45
2014*	1.56	3.38	10.35	12.54	3.16	8.66

Source: Economic Review 2013-14, Govt. of Rajasthan, Jaipur *estimated figure

By the early eighties, the composition of farm power has also undergone a remarkable change. The share of draught power that was about 90 per cent in 1961 has declined to 27 per cent by 2003 and it contributed to 14 per cent in the year 2014. The share of irrigation equipments increased from 6 per cent to 52 per cent and that of tractors from 2 per cent to 22 per cent. About 93 per cent of the mechanical power in agriculture is derived from oil engines and electric pump-sets and the latter is increasing at a faster rate in recent years. Consequently, the consumption of electric power per hectare of cultivated area has increased rapidly. The cropped area has also increased from 123,455 ha in 1983 to 128,651 ha in 2003 and 156,456 ha in the year 2014 in the Thar Desesrt of Rajasthan.

(v) Milk Yield and Lactation Period

It has become a general thinking of public that indigenous cows are not good milk yielders and their lactation period is also very short (5-6 months) than buffaloes and hybrid cows (8-9 months). Although it is well known that indigenous cow milk is better than crossbred and hybred cows and digestive than buffalo milk but the rate of milk of both indigenous and hybred cow is the same. Therefore, the farmers prefer hybrid cows and buffaloes than indigenous cows. In the same way, demand of goats is greater than sheep both for milk and meat.

7. Structure of Milch Animals

According to Livestock Census 1966, there were 42.30 per cent cows, 34.24 per cent buffaloes, 67.89 per cent sheep, 41.27 percent goats and 87.03 per cent camels of the State in the Thar Desesrt of Rajasthan and the study area shared 47.87 per cent of the total livestock wealth of the State. Out of the total livestock, cows shared 30 per cent, buffaloes 6.76 per cent, sheep 35.84 per cent and goat 23.03 per cent, showing that number of milch animals was highest out of the total livestock population.

In 1988, the Thar Desesrt of Rajasthan contributed 31.02 per cent of cows, 27.72 per cent buffaloes, 65.28 per cent sheep, 43.10 per cent goats and 78.93 per cent camels of the State. The share of sheep (36.50 per cent) and goats (30.52 per cent) increased than cows (19.07 per cent) and buffaloes (9.09 per cent) in the study area. The share of bovines was 36.76 per cent in 1966, declined to 28.97 per cent in 1988 whereas the share of goats increased from 23.03 per cent in 1966 to 30.52 per cent in 1988. The leading districts in the total livestock were Nagaur (24.66 lakh), Ganganagar (20.35 lakh), Pali (20.06 lakh) and Jodhpur (18.30 lakh).

Table 3
Thar Desert of Rajasthan - Milch Animals (1961-2012)
(in lakh)

Year	Cow		Buffalo		Sheep		Goat	
	Thar	Raj	Thar	Raj	Thar	Raj	Thar	Raj
1961	46.90	135.52	9.92	42.17	55.91	82.42	32.28	74.01
1966	46.89	131.23	10.55	42.22	N A	88.06	35.92	103.23
1972	34.80	124.69	11.08	45.92	51.59	85.56	58.14	121.62
1977	40.34	128.96	13.79	50.71	N A	102.35	61.74	123.06
1983	N A	135.04	N A	60.43	N A	134.31	N A	154.80
1988	33.88	109.21	17.58	63.43	64.84	99.32	54.21	125.77
1992	39.14	116.66	22.97	77.54	83.61	124.91	78.25	152.84
1997	49.59	121.58	31.55	97.56	104.93	143.12	95.30	169.36
2003	41.16	108.53	32.02	104.46	74.32	100.31	84.42	168.08
2007	50.54	121.19	34.50	110.91	84.31	111.89	97.00	215.02
2012	61.80	132.24	39.46	129.76	68.77	90.79	127.88	216.65

Source: Livestock Census 1961-2012, Animal Husbandry Department, GoR, Jaipur.

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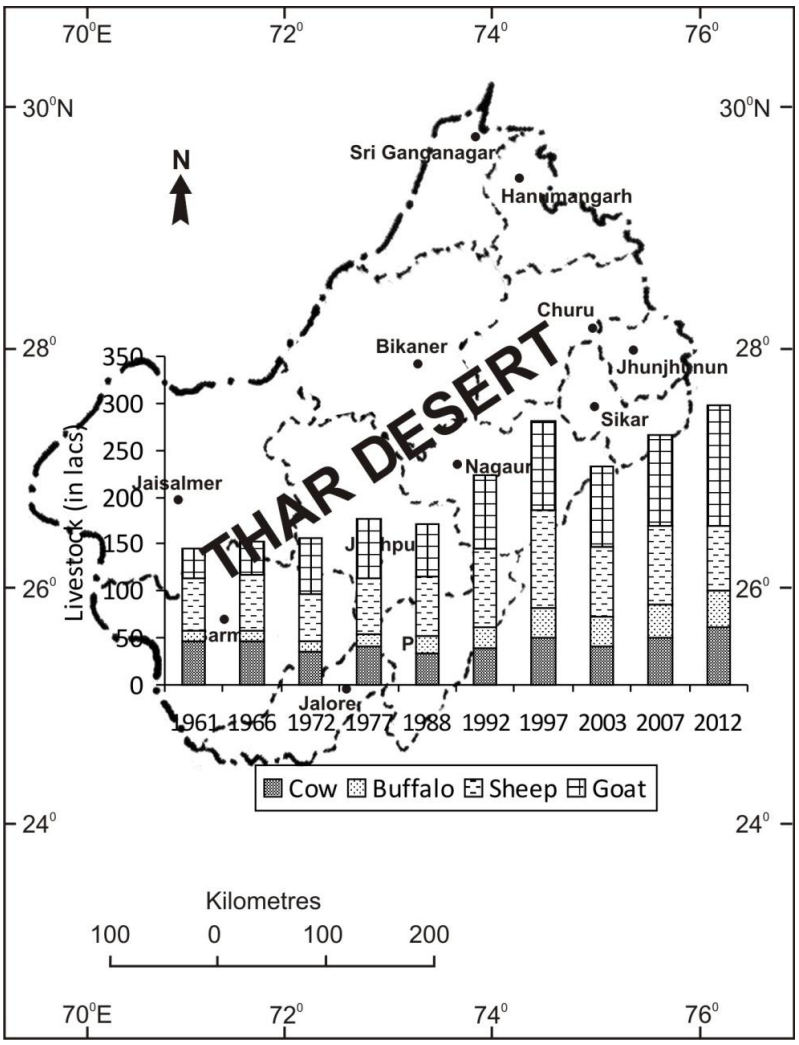
Figure 1
Thar Desert of Rajasthan - Milch Animals (1961-2012)



The study area contributed 51.37 per cent of the total livestock wealth of the State (Livestock Census, 2007). There were 41.70 per cent cows, 31.10 per cent buffaloes, 75.35 per cent sheep and 45.11 per cent goats of the State. The data given in the table show that goat (36.41 per cent) followed by sheep (31.65 per cent), cow (18.97 per cent) and buffalo (12.95 per cent) constituted the major part of the livestock in the study area. During the period 1966-2012, share of goat increased than sheep (table 3 & figure 1). The cows shared 82.56 per cent of the total bovine population of the study area in 1966 has decreased to 65.83 per cent in 1988, 56.24 per cent in 2003 and 41.70 per cent in 2007 but again their contribution has gone upto 61.02 per cent. During this period, the contribution of buffaloes increased speedily and this trend is recorded in whole of the study area.

It is important to mention here that the number of indigenous cows is declining while the number of buffaloes and hybrid cows are showing an inceasing trend. The number of cows was 46.90 lakh in 1961, has slightly increased to 61.80 lakh (31.76 per cent) in the last 52 years. Whereas number of buffaloes was only 9.92 lakh in 1961 has reached upto 39.46 lakh (297.78 per cent) in 2012. The number of sheep increased from 55.91 lakh to 68.77 lakh while goat population increased from 32.28 lakh to 127.88 lakh during the same period. Among the milch animals, buffaloes recorded the maximum growth rate (297.78 per cent).

8. Outcome of the Study

(i) Factors Responsible for Structural Changes

The respondents throughout the study area claimed that low milk yield (37 per cent), short lactation period (24 per cent) and low demand of draught power (18 per cent) are the major reasons behind the ignorance of indigenous cow breeds. The other factors are shrinkage of grazing land (9 per cent), equal price of milk (7 per cent) and commercialization of livestock rearing (5 per cent). The rural farmers replied that the milk-men pay the same rate for hybrid cow's milk. It is also important to note here that the cattle rearers (43 per cent) are well known that indigenous cow breeds are well adapted to local climate and can survive on normal feeding of

grasses and roughages. They need only 3/5 quantity of feed and fodder required by hybrid cows and buffaloes. The hybrid cows and buffaloes also need more veterinary services (27 per cent) alongwith useless calves (13 per cent), less number of calving periods (10 per cent) and early barrenness of hybrid cows (7 per cent).

(ii) Mechanization of Agriculture

It is responded that even today 28 per cent of the farmers prefer draught power as it is better means of tilling, ploughing and cleaning activities. It does not require much investment and can survive on normal feeding of roughages and concentrates (10-15 kg) which cost Rs 120-180/day. This cost can be reduced by open grazing and feeding of field produces. Some of the old farmers responded that animals are also eco-friendly, when they were used in agriculture, there was abundant groundwater, vast grazing lands, perennial grasses, shrubs and plants and was prosperity in the society. They have also replied that there was lot of milk, butter, curd and ghee to eat but nowadays, all these things have reached beyond the limits, ghee Rs. 350-600/lt, cow milk Rs. 28-34/lt, buffalo milk Rs. 38-50/lt and curd Rs. 55-60/lt.

Most of the farmers use threshers and tractors (machines) for cleaning of crops. There are only 6 per cent farmers who clean their crops by using traditional methods. It is observed during the harvesting period of crops that the farmers have to wait 8-10 days for tractors and threshers. It is replied by the aged farmers that the youngster do not perform any field and cattle work and, they always depend on machines.

The farmers prefer tractor due to- large covering area (23 per cent), time saving (18 per cent), cheaper (15 per cent), easy ploughing, sowing, harvesting and threshing (12 per cent), labour saving as number of family members declining due to breaking of joint families (12 per cent), other source of income (10 per cent), frequent droughts (6 per cent), and suitable for large land holdings (4 per cent).

Some of the livestock rearers have preferred draught power as they are- useful for small land-holdings (31 per cent), low feeding cost (24 per cent), low investment (16 per cent), simple and cheap equipments (14 per cent), use of household labour (9 per cent) and their eco-friendliness (6 per cent).

(iii) Feeding and Health Care

In the irrigated areas, cost of cattle feed is considered to be normal. But in the rainfed areas where the cattle rearers used to buy roughages and concentrates from market, then it becomes very significant. It is observed during the field survey that bovines are fed green fodder with roughages in irrigated areas of Ganganagar, Hanumangarh, Bikaner, Jodhpur and Jaisalmer districts. They also feed 3-5 kg of cattle feed like grain-bran, *churi, khal, chapat* etc. to milching bovines. It is interesting to note that farmers of unirrigated areas feed and care bovines very well for higher milk yield. The cattle rearers engaged in dairy industry expend more on feeding and health care than the normal cattle rearers. The commercial cattle rearers replied that in dairy industry, more than 50 per cent expenditure is done on purchase of feed and fodder, 15 per cent on labour and 10 per cent on medical and miscellaneous expenditures. Therefore, it is concluded that there is about 25-40 per cent profit range in the livestock rearing. If we add, sale of calves and cow-dung, family fuel and labour cost, the profit range reaches up to 50 per cent.

(iv) Suggestions for Improvement

The cattle rearers of the study area in the sample villages have suggested that livestock rearing can be a good source of sustainable development through feeding management (24 per cent), utilization of dependent animals (22 per cent), availability of good quality bulls (18 per cent), availability of grazing land (16 per cent), veterinary services (13 per cent) and credit facilities (7 per cent).

9. Conclusion

It is concluded by the present study that the proportion of indigenous cows is declining which suggests to stress on up-gradation of indigenous cows not only as a source of milk but also as their well adaptability to local environment, long economic viability and lower feeding cost.

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