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FACTORS AFFECTING TRACTORISATION IN ARID RAJASTHAN AND DEMAND PROJECTIONS

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ABSTRACT

The demand for the tractors by the turn of the century and the factors affecting tractorisation in arid Rajasthan have been analysed. The analysis revealed that the growth of tractors was highly instable. Still the estimated demand for tractors by the turn of the century is 81000. The main factors affecting tractorisation in the region were irrigated area and draught power. Tractorisation of agricuture can get a fillip in the region with irrigation and significant reductions in draught power.

INTRODUCTION

Arid region of Rajasthan is mostly mono-cropped. Except in Ganganagar district with substantial irrigated cropped area the adoption of improved production technology and mechanisation of agriculture is poor due to scanty and erratic rainfall. Kalla *et al.* (1986) observed deficiency of traction energy in the region. Tractorisation of farm operations is one of the important components of mechanisation process. Elsewhere in the country, tractorisation of farm operation might have been due to shortage of labour, increased cropping intensity or higher rates for draught and man power (Bhattacharjee, 1949). None of these factors is generally operative in arid Rajasthan, but still the number and use of tractors in agriculture are on the increase.

Therefore, a study on the growth of tractors in different zones of the region and the factors affecting this growth was undertaken to project the demand for tractors by the turn of this century.

MATERIAL AND METHODS

The data on number of tractors and draught power for different districts of arid zone were obtained from quinquennial report of the Livestock Census (1977) of Rajasthan. The land utilisation data were obtained from the statistical abstracts of Rajasthan. The data were then grouped for the four agro-climatic zones described by Krishnan (1968). Ganganagar district which comes under zone I in the former classification was placed under zone IV in view of higher irrigated area in this district.

For the inter-censal period the data were interpolated following Newton's method (Freeman, 1960). Amongst the alternative functions tried to study the growth

of tractors, quadratic function was the 'best-fit' and that was selected for forecasting the demand for tractors. The most relevant factors associated with the process of tractorisation were identified by the step-down regression. The independent variables considered were net sown area (X_1), gross cropped area (X_2), cropping intensity (X_3), net irrigated area (X_4) and draught power (X_5). for Y, the number of tractors.

RESULTS AND DISCUSSION

The best-fit quadratic function along with R^2 and coefficients of variation (CV) are presented in table 1. The coefficient of variation for tractorisation was 83 per cent

Table 1. Quadratic growth function for tractors in arid western Rajasthan.

Group	Function	R^2	Mean	SD	CV
Zone I	$Y = 204.20 - 60.68\ X + 8.42\ X^2$	0.9856	960.86	924.72	96.33
Zone II	$Y = 247.12 - 72.25\ X + 8.27\ X^2$	0.9899	843.90	828.79	98.21
Zone III	$Y = 253.26 - 54.09\ X + 5.38\ X^2$	0.9908	558.77	495.23	88.62
Zone IV	$Y = 2177.53 - 347\ X + 24.5\ X^2$	0.8672	2419.27	1788.85	73.94
Arid region of W. Rajasthan	$Y = 2882.55 + 534.92\ X + 46.07\ X^2$	0.9635	4782.69	3961.12	82.82

for the whole region, the range being 74% (zone IV) to 98% (zone II). There was a rather systematic positive relationship with aridity. Evidently tractorisation without support of irrigation would essentially be characterised by fluctuations.

The demand of tractors in the region by the turn of the century (Table 2) would

Table 2. Estimated* demand for tractors in arid zones of western Rajarthan

Region	1982	*1987	*1992	*1997	*2000
Zone I	4704	6885	9486	12508	15 52
Zone II	4325	6404	8896	11788	15119
Zone III	2715	4032	5617	7471	9595
Zone IV	10669	16162	22879	30822	39989
Arid region of W. Rajasthan	22462	33555	46982	62742	80835

*The estimates were derived from quadratic function given in Table 1.

be of the order of 80,800, registering more than five times increase over the position (14,759) in 1977. The demand in different zones would be 6, 5, 5, 6, and 5 times of that in 1977 in zones I, II, III and IV, respectively. It may, therefore, be inferred that rate of demand for tractors in these agro-climatic zones would be of more or less the same order as in the entire arid zone.

Table 3. Significant determinants of tractorisation in arid Rajasthan

	Zone I	Zone II	Zone III	Zone IV	Arid Zone
Independent Variables :					
Constant	16987.31	—66226.063	8955.6998	92592.98	11006.11
Net sown area ('000 ha) (X_1)	—58.4171** (11.3354)	—	—	—	—
Total cropped area ('000 ha) (X_2)	—	—	—	+136.7946** (34.3857)	—
Cropping intensity (%) (X_3)	—164.617* (31.837)	+667.5043* (2.7268)	—	—	—
Net irrigated area ('000 ha) (X_4)	—	—	+6.2239** (1.8048)	—	+15.7421** (2.05)
Draught power ('000 Nos) (X_5)	—	—	—23.251** (4.1947)	—123.7546** (50.7509)	—12.4561** (3.5422)
R^2	0.74	0.33	0.77	0.54	0.909
F Value	12.33**(3,13)	7.14**(1,15)	24.17**(2,14)	8.26**(2,14)	70.64**(2,14)

**Significant at P = 0.01 *Significant at P = 0.05

Figures in parentheses are standard errors

Factors affecting tractorisation

To establish relative importance of different variates in each of the zones, multiple regression equations with growth in number of tractors were generated using the step-down regression co-efficients for each zone and the region as a whole (Table 3). In zone I, the effect of net sown area (X_1) and cropping intenstty (X_3) were negatively significant, indicating that large area covered and existing level of cropping intensity may only result in a decline in the number of tractors in the long run. In zone II, only the cropping intensity may result in increased number of tractors. Similarly in zone III and IV, the tractors may register a decline with an increase in the number of draught animals. Finally, expansion of irrigation may invariably result in an increased demand for the tractors. It, thus, seems plausible to conclude that existing constraint in resource endowments, slow pace of irrigation and competitive usage of bullock power may dampen demand for tractors in arid region of western Rajasthan.

Net irrigated area and draught power significantly affected tractorisation at regional levels. Obviously, irrigated area was positively associated and draught power negatively associated with growth of tractors. However, the present growth of tractors in arid zone is governed largely by factors other than agriculture as indicated by the negative co-efficients of net area sown, total cropped area and cropping intensity at zonal as well as regional levels.

Tractorisation in the region may get momentum if area under irrigation is increased but it is unlikely since most of the area, particulary in zones I and II, is potntially irrigable only at a very high cost. Moreover, the negative influence of draught power on the number of tractors in zones III, IV and the region on the whole indicates a need to check the growth of draught power, if the procsss of tractorisation in arid agriculture is to be backed up significantly.

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