Setting Research Priority for Livestock Sector in Gujarat

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Abstract

Research resource allocation strategy has been worked out for the livestock sector across districts/ regions of the Gujarat state by using multi-criteria scoring model. The study has coverd all the 19 districts of the state and six livestock species. In the commodity priority, the highest share (83%) has been claimed by milk research, followed by draught power (15%). The research share of meat, egg, skin and hair & wool is very low. The trend has been found same in the state as well as the districts. Within milk research, buffalo milk has got the highest priority in all the districts and research on poultry meat has claimed the highest share in meat research in most of the districts. The hide research should focus on the goat hide in the most of the districts. Wool research has claimed the highest priority in the Saurashtra, Middle and North Gujarat regions, while the South Gujarat region should focus on goat hair research. For the wool and hair research, the Kachchh district should receive the highest priority.

Introduction

The agricultural sector in India contributed about 40 per cent to the GDP during 1960s. It has gradually decreased to about 20 per cent in recent years, whereas the contribution of livestock to Ag DGP has increased from 14 per cent in 1980-81 to 30 per cent in 2000-01. Since 1980, the contribution of livestock to GDP has been growing at an annual rate of about 7.3 per cent, which is much higher than the growth in Ag GDP and GDP of India. In the Gujarat state also, the contribution of agricultural sector to gross state domestic product (GSDP) has gradually decreased from 21.26 per cent in 1997-98 to 14.98 per cent in 2001-02, while during this period, the contribution of livestock sector has increased from 22.67 per cent to 31.56 per cent, with an annual growth rate of six per cent (Anonymous, 2003). It indicates that livestock research contributes significantly to the growth of livestock as well as

agricultural sectors simultaneously. But, the problem of resources for research is forcing the institutions to do priority setting which is nothing but efficient use of scarce resources as per national goals.

Livestock research priorities should (i) contribute towards improving the efficiency of livestock production, (ii) integrate livestock into sustainable systems (iii) take into account rural development, equity, food security, social development and gender issues, and (iv) use financial resources in a more planned way. Making choices on research issues in livestock development is difficult and complex. Kirschke (1993) had suggested that research should focus on crucial elements, which include increased production, beneficial impact, efficient use and optimization of resources. With this perspective, the present study was carried out in different districts of Gujarat with the objectives of setting research priorities (i) by commodity groups, and (ii) among the species.

Methodology

For setting research priorities, all the 19 old districts of Gujarat state were considered. For the

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estimation of zone-wise research priority, the state was divided into 4 zones, viz. Saurashtra, Middle Gujarat, North Gujarat and South Gujarat. The data collected from the Office of the Directorate of Agriculture and Animal Husbandry, Gujarat State, centered around the year 2001(Average of 2000-01, 2001-02 and 2002-03).

Analytical Framework

Livestock species are multi-functional in nature. This multi-functionality makes the priority assessment exercise a complex process. For making the priority setting process simple, the multi-criteria scoring model, which is also known as congruence model, was used (Birthal *et al*., 2002). In this model, the first step was to identify research objectives that were consistent with the national or regional development goals. These are given in Table 1. Then, appropriate weight was assigned to each indicator based on its relative importance. Since no prior information regarding the weights of research objectives was available, equal weight (0.25) was assigned to each objective.

Construction of Initial Base Line (IBL)

For allocating research resources across the districts in proportion of the weighted share of indicators reflecting different research objectives, initial base line (IBL) was constructed for each district as per Equation (1):

$$B_i = \sum_{i=1}^{k} W_j D_{ij} \qquad \qquad \dots(1)$$

where, B_i is the initial base line for the *ith* district; W_j is the weight of the *jth* extensity parameter; D_{ij} is the share of the *ith* district/region in the *jth* extensity parameter.

Since allocation of research resources based on IBL may not fully consider the size and intensity of the problem, intensity indicators were used to modify IBL (Table 2). Equal weight, i.e. 0.3333 was assigned to each modifier, according to CGIAR (1992), higher weights to the modifiers bring in considerable distortions in relative ranking of regional priorities. Further, equal weight was given to all the sub-modifiers to make the overall weight to unity as per details given in Table 3.

The impact due to all the modifiers was added to the IBL to get the modified base line, B_i' as per Equation (2):

$$\text{Modified base line} \quad B_i' = B_i + \sum_{i=1}^{m} X_{ij} \qquad \dots(2)$$

where, X_{ij} is the amount of impact due to the *jth* modifier of the *ith* district or region on B_i; B_i is the initial base line of the *ith* district or region; and *m* is the number of modifiers, i.e. $m = 7$

The impact due to all the modifiers was worked out by aggregating the impact of each modifier (+ve and −ve) on IBL. As the summation of modified base line was rarely 100, it was adjusted to 100 to get new priority distribution or the final base line (FBL) as per Equation (3):

$$B_i'' = \frac{B_i'}{\sum_{i=1}^{n} B_i'} \times 100$$

where, B_i'' is the final base line of the *ith* district; B_i is the modified base line of the *ith* district ; and *n* is the number of districts ($n = 19$).

The final base line of a district indicated the level of research priority of that district based on

Table 1. Developmental goals, research objectives and extensity parameters for livestock research system

Sl No.	Goals	Research objectives	Indicator/extensity parameters
1.	Growth acceleration	Enhance productivity	Value of livestock production (VOP)
2.	Equity	Increase income of people below poverty line	Number of poor people (POOR)
		Improve nutritional status	Under-nourished population (UNUR)
3.	Sustainability of livestock system	Improve livestock- carrying capacity of land	Land available for livestock (CPR)
4.	Participation in trade	Export promotion	Value of livestock export (EXPO)

Table 2. Intensity indicators used to modify IBL

Goals	Research objectives	Modifiers	Direction of influence on IBL
Growth acceleration	Enhance productivity	Scope for growth in milk production (yield gap in indigenous, crossbred cows & buffalo)	+
Equity	Augment income of BPL households	Share of marginal and small farmers	+
	Improve nutritional security	Per capita availability of milk and eggs	-
Sustainability of production	Improve carrying capacity of land for livestock	Livestock density	+
Participation in trade	Export promotion	No modifier	

Table 3. Assigning of weight and sign to modifiers

Total weight	Efficiency modifier (**1/3**)		Yield gap for indigenous cow	(**1/9**)
			Yield gap for crossbred cow	(**1/9**)
			Yield gap for buffalo	(**1/9**)
	Equity modifiers (**1/3**)	Economic equity (**1/6**)	Share of marginal and small farmers	(**1/6**)
		Nutritional equity(**1/6**)	Per capita milk	(**1/12**)
			Per capita egg	(**1/12**)
Unit	Sustainability modifier (**1/3**)	$Adj(VOP)_{ci}$	Livestock density	(**1/3**)
Total	**1**			**1**

efficiency, equity, sustainability and export. Higher the value of FBL, higher was the resource allocation to that district or vice-versa. For funding a research activity, priority setting among the commodities was very important. It was done by adjusting the VOP of each species in each district by an adjustment factor.

$$\text{Adjustment factor} = \frac{B_i''}{D_{i(VOP)}}$$

Adj (VOP) = VOP $\times$ Adjustment factor.

For commodity priorities at the state level, formula (4) was used :

$$X_c = \frac{\sum_{i=1}^{n} Adj(VOP)_{ci}}{\sum_{c=1}^{l}\sum_{i=1}^{n} Adj(VOP)_{ci}} \times 100 \qquad \ldots(4)$$

For commodity priorities at the district level, formula (5) was used :

$$X_{ci} = \frac{Adj(VOP)_{ci}}{\sum_{c=1}^{l} Adj(VOP)_{ci}} \times 100 \qquad \ldots(5)$$

For commodity priorities across the districts, formula (6) was used :

$$X_{ci}' = \frac{Adj(VOP)_{ci}}{\sum_{i=1}^{n} Adj(VOP)_{ci}} \times 100 \qquad \ldots(6)$$

where,

X_c = Share of resource for the *cth* commodity at the state level

X_{ci} = share of resource for the *cth* commodity in the *ith* district

= share of resource for the *ith* district in the *cth* commodity research

= Adjusted VOP of the *cth* commodity in the *ith* district, and

$c = 1, 2, ..., l$, i.e. milk, meat, hide, hair and wool, egg ,etc.

The priority setting of commodities within the species at the district and state level as well as across the districts was made by modifying the above procedure, similarly.

Results and Discussion
Product Priorities in Livestock

Commodity- or service-wise priority setting, presented in Table 4, shows that research on milk production claims the height (82.86 %) of livestock research resources of the state, followed by draught power (15.49%). The share in research allocation to meat, egg, skin & hide and wool & hair has been found less than one per cent each. In all the regions as well as districts, milk research gets the highest priority, followed by draught power. For allocation

of research resources to milk among districts of the Saurashtra region, Kachchh should be given the highest share (81.27%), followed by Junagadh (79.38%), Bhavnagar (72.73%), Rajkot (67.29%) and Amreli (66.76%). None of the districts in Saurashtra region should give emphasis on research for meat, eggs and hide because the consumption of these products in this region is very low. For the draught power research in this zone, Surendranagar should put the highest share (38.11%) to it, followed by Jamnagar (35.26%), Amreli (32.94%) and Rajkot (31.89%). The reason is that most of the farmers in this zone carry their agricultural operations with bullock power, due to its easy and cheap availability as compared to mechanical power. The share of wool and hair research though is very small in the districts of this zone, it is much higher than in other districts of the Gujarat state, because wool production is higher in the Saurashtra region than other districts.

Table 4. Research priority by commodity groups in different districts of Gujarat (%)

Districts/zones	Milk	Meat	Skins	Wool & hair	Draught power	Eggs
Amreli	66.76	0.01	0.00	0.27	32.94	0.03
Bhavnagar	72.73	0.74	0.01	0.36	25.77	0.39
Jamnagar	63.70	0.66	0.06	0.27	35.26	0.05
Junagadh	79.38	0.51	0.04	0.08	19.90	0.10
Kachchh	81.27	0.03	0.00	1.10	17.51	0.10
Rajkot	67.29	0.48	0.02	0.21	31.89	0.10
Surendranagar	61.68	0.03	0.00	0.17	38.11	0.01
Saurashtra zone	**73.36**	**0.31**	**0.02**	**0.50**	**25.69**	**0.12**
Ahmedabad	78.38	1.77	0.15	0.04	19.06	0.60
Gandhinagar	97.60	0.15	0.00	0.05	1.88	0.31
Kheda	91.09	2.17	0.05	0.02	5.49	1.18
Panchmahals	91.75	0.72	0.04	0.01	6.67	0.82
Vadodara	82.78	0.55	0.04	0.00	16.35	0.29
Middle Gujarat zone	**88.66**	**1.17**	**0.05**	**0.02**	**9.34**	**0.76**
Banaskantha	90.38	0.33	0.00	0.11	8.95	0.23
Mehsana	93.02	0.16	0.01	0.03	6.64	0.14
Sabarkantha	91.76	0.42	0.00	0.03	7.62	0.18
North Gujarat zone	91.81	0.29	0.00	0.06	7.66	0.18
Bharuch	75.91	1.03	0.06	0.00	22.60	0.41
Dang	49.34	1.80	0.00	0.00	42.45	6.40
Surat	87.97	2.78	0.20	0.01	7.64	1.39
Valsad	88.69	3.39	0.06	0.00	5.28	2.59
South Gujarat zone	**83.35**	**2.39**	**0.11**	**0.01**	**12.57**	**1.57**
Gujarat state	82.86	0.88	0.04	0.20	15.49	0.54

In the Middle Gujarat zone, milk research claims the highest priority with a share of 88.66 per cent, followed by draught power (9.34%) and meat (1.17%). Among different districts of this zone, the Gandhinagar district should give the highest priority to milk research, followed by the district of Panchmahals, Kheda and Vadodara. For draught power research, only the districts of Vadodara and Ahmedabad claim more than 15 per cent of their livestock research resources, while Gandhinagar claims only 1.18 per cent, suggesting that the agricultural operations in Gandhinagar district are mostly done using machine power. Research on meat, eggs, skin and hair claims very little share in all the districts of Middle Gujarat also.

The resource allocation on milk research to the North Gujarat zone, demands higher share than to other zones. Draught power research in this region gets only 7.66 per cent, indicating the declining role of bullock power. In this zone, research on meat, egg and wool and hair also claims a little share. All the districts of this zone claim more than 90 per cent of their respective livestock research resources for milk research, the share of rest of the products being negligible.

Like other regions, milk research dominates other areas of research with a share of 83.4 per cent in livestock research resources of South Gujarat zone, and is followed by draught power research (12.57%). South Gujarat should allocate 2.4 and 1.6 per cent of its livestock research resources to meat and egg production research, respectively, which though small, is much higher than in the other regions. Except Dang, all the districts of South Gujarat should allocate more than 75 per cent of their livestock research resources to milk research. The Dang district should allocate 42.5 per cent of its livestock research resources to draught power research, which is the highest among all the districts of Gujarat. Dang being a hilly area, size of holding is very small, hence bullock labour is the only option. Generally, the poultry is reared by the tribal people in the Gujarat state. The concentration of tribal people being higher in the Dang district, it claims the highest share of 6.40 per cent of its livestock research resources for egg production research.

Research Resource Allocation among Species

Milk

Priority in milk and meat research among the species in different districts of Gujarat is given in Table 5. The research on buffalo milk production gets the highest priority (69.%) in the state, followed by cattle milk (28%) and goat milk (3%). The same priority has been observed in different districts also. The region-wise research resource allocation among species revealed that buffalo milk research should get the highest share (76%) in North Gujarat, followed by Middle Gujarat (75%), South Gujarat (69%) and Saurashtra (59%).

In the Saurashtra region, buffalo milk production research should receive the highest priority with a share of 59.2 per cent, followed by cattle (37.3%) and goat (3.5%) milk research. Among all the regions, Saurashtra should give the highest share to cow milk research, may be due to the traditional rearing of famous Gir cows. The Kachchh district should give the highest priority to cow milk research than other districts of Saurashtra, while in the Junagadh district, buffalo milk research claims the highest share of 71.3 per cent of its milk production research resources, followed by the districts of Bhavnagar (67%), Amreli (65%) and Jamnagar (63%). In the case of goat milk research, the district of Kachchh should give the highest priority (5.6%), followed by Surendranagar (4.6%), Amreli (2.9%) and Bhavnagar (2.8%). Thus, districts of Saurashtra should give a higher priority to research on buffalo and goat due to a higher concentration of superior local breeds of Jaffrabadi buffaloes and Kachchhi goats in these areas.

Among different districts in the Middle Gujarat region, the cattle milk production research gets the highest priority in the Ahmedabad district, followed by the districts of Vadodara, Gandhinagar, Panchmahals and Kheda. In the case of research allocation to buffalo milk, Kheda claims the highest (81%) share, followed by Gandhinagar (76%), Panchmahals (74%) and Vadodara (73%). The share of goat milk research is less than 2.5 per cent in all the districts, except Panchmahals in this zone.

In the North Gujarat region, all the districts should give high priority to buffalo milk production research, due to the higher concentration of

Table 5. Research priority in milk and meat among the species in different districts of Gujarat

(in per cent)

Districts/zones	Milk			Meat				
	Cattle	Buffalo	Goat	Cattle	Buffalo	Goat	Sheep	Poultry
Amreli	32.47	64.65	2.88	0.00	0.00	0.00	0.00	100.00
Bhavnagar	30.03	67.18	2.78	0.00	15.51	0.76	0.52	83.20
Jamnagar	35.38	62.63	1.99	0.00	11.36	45.71	37.45	5.48
Junagadh	27.36	71.31	1.33	0.00	92.11	0.00	0.00	7.89
Kachchh	44.89	49.53	5.58	0.00	0.00	0.00	0.00	100.00
Rajkot	39.21	58.64	2.15	0.00	39.29	2.31	1.21	57.19
Surendranagar	39.03	56.41	4.56	0.00	79.65	0.00	1.51	18.84
Saurashtra zone	**37.25**	**59.23**	**3.52**	**0.00**	**38.68**	**11.00**	**8.87**	**41.45**
Ahmedabad	30.44	68.09	1.46	0.00	37.61	28.27	23.33	9.93
Gandhinagar	23.59	75.65	0.76	0.00	8.08	0.52	0.19	91.21
Kheda	18.19	80.52	1.30	3.10	16.75	3.44	2.14	74.58
Panchmahals	21.62	74.26	4.12	47.20	16.44	13.72	0.00	22.64
Vadodara	25.09	72.69	2.22	0.00	0.00	36.80	31.19	32.02
Middle Gujarat zone	**22.36**	**75.17**	**2.47**	**11.80**	**19.02**	**13.11**	**8.08**	**47.84**
Banaskantha	22.25	75.20	2.55	0.00	0.00	0.00	0.00	100.00
Mehsana	19.33	79.62	1.05	0.00	2.98	36.59	20.57	39.85
Sabarkantha	23.61	73.34	3.05	0.00	0.00	0.00	0.00	100.00
North Gujarat zone	**21.59**	**76.26**	**2.15**	**0.00**	**0.59**	**7.25**	**4.08**	**88.08**
Bharuch	25.24	71.80	2.96	0.00	14.40	39.47	12.45	33.67
Dang	21.63	78.37	0.00	0.00	0.00	0.00	0.00	100.00
Surat	26.61	72.54	0.85	3.74	16.31	42.77	13.77	23.42
Valsad	42.64	55.40	1.96	0.00	0.51	11.71	4.23	83.55
South Gujarat zone	**30.88**	**67.37**	**1.75**	**1.69**	**9.47**	**29.13**	**9.53**	**50.18**
Gujarat	28.31	69.05	2.63	5.33	16.49	19.08	8.53	50.51

'Maheshani' buffaloes in this region, which provide milk of good quality with higher productivity as compared to that by the indigenous cows. The share of cattle milk research is around 20 per cent in each district of this region.

The priority of resource allocation to milk production in the South Gujarat region is the same as in other regions, buffalo milk demanding the highest share of 67 per cent, followed by cattle milk (31%) and goat milk (2%). However, the Valsad district should allocate about 55 per cent to buffalo milk research and a comparable share of 43 per cent to cattle milk research, which is second highest in all districts in the state.

Meat

District-wise research resource allocation to meat research among species revealed some astonishing results:

(i) Five (Amreli, Kachchh, Banaskantha, Sabarkantha and Dang) of the 19 districts in the state should allocate 100% resources to poultry meat research, while four districts should also give high priority to it; these are Gandhinagar (91%), Valsad (84%), Bhavnagar (83%) and Kheda (75%). Three districts should give very low priority (less than 10%), three districts should give low priority (around 20%), while the remaining four districts claim moderate priority (30-40%) to it.

(ii) The buffalo meat research claims the highest (92%) priority in Junagadh, followed by Surendranagar (80%), Rajkot (39%) (all the three districts are in the Saurashtra region), and Ahmedabad (38%). All other districts have low or zero priority for buffalo meat research.

(iii) The goat meat research receives the highest (46%) priority in Jamnagar, follwed by Surat

(43%), Baruch (39%), Vadodara (37%), Mehsana (37%), and Ahmedabad (28%). All other districts claim low or zero priority for goat meat research.

(iv) The sheep meat research claims highest prioroty in Jamnagar (37%), follwed by Vadodara (31%), Ahmedabad (23%) and Mehsana (21%). In all other districts priority allocation to sheep meat research is either zero or very low.

(v) Surat is the only district to have claimed priorities for all the five types of meat.

(vi) Research priority is claimed in buffalo and poultry meat by six (Bhavnagar, Junagadh, Rajkot, Surendranagar, Gandhinagar and Kheda) districts and in goat and sheep meat by some other six districts, viz. Jamnagar (83%), Vadodara (68%), Mehsana (58%), Surat (56%), Bharuch (52%) and Ahmedabad (51%).

Hide and Wool & Hair

Table 6 shows the allocation of resources to hide and wool & hair research among different species in 19 districts of Gujarat. At the state level, the highest share is received by goat hide research (42%), followed by buffalo hide (31%), sheep hide (20%) and cattle hide (6%).

In the Saurashtra region, the highest resource share of 61.65 per cent is claimed by buffalo hide research resources, followed by goat hide (20%) and sheep hide (18%). Bhavnagar, Junagadh, Rajkot and Surendranagar are the districts, where buffalo hide research gets the highest priority, whereas in the Jamnagar district, goat and sheep hides get nearly equal priorities at the district level. In the Middle Gujarat region, buffalo and goat hides together claim more than 65 per cent of its hide research resources and the remaining resources are allocated to cattle and sheep hide research. The districts of

Table 6. Research priority in hide & wool and hair among the species in different districts of Gujarat

(in per cent)

Districts/zones	Hide (100 %)				Wool &Hair (100 %)		
	Cattle	Buffalo	Goat	Sheep	Sheep	Goat	Pig
Amreli	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Bhavnagar	0.00	90.90	5.27	3.83	99.98	0.02	0.00
Jamnagar	0.00	10.13	47.97	41.90	98.87	1.13	0.00
Junagadh	0.00	100.00	0.00	0.00	100.00	0.00	0.00
Kachchh	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Rajkot	0.00	90.27	6.24	3.49	99.95	0.05	0.00
Surendranagar	0.00	97.67	0.00	2.33	100.00	0.00	0.00
Saurashtra zone	**0.00**	**61.65**	**20.63**	**17.72**	**99.93**	**0.07**	**0.00**
Ahmedabad	0.00	37.56	33.22	29.22	86.68	12.14	1.18
Gandhinagar	0.00	90.45	6.82	2.73	99.98	0.02	0.00
Kheda	7.09	64.67	17.88	10.36	94.89	5.11	0.00
Panchmahals	46.22	27.11	26.67	0.00	83.04	16.96	0.00
Vadodara	0.00	0.00	52.54	47.46	0.00	100.00	0.00
Middle Gujarat zone	**13.49**	**36.67**	**30.31**	**19.53**	**89.25**	**10.35**	**0.39**
Banaskantha	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Mehsana	0.00	3.62	65.10	31.28	97.68	2.32	0.00
Sabarkantha	0.00	0.00	0.00	0.00	100.00	0.00	0.00
North Gujarat zone	**0.00**	**3.62**	**65.10**	**31.28**	**99.53**	**0.47**	**0.00**
Bharuch	0.00	21.73	54.71	23.56	0.00	100.00	0.00
Dang	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Surat	2.57	18.94	58.44	20.05	0.00	100.00	0.00
Valsad	0.00	2.62	70.28	27.10	0.00	100.00	0.00
South Gujarat zone	**1.81**	**17.10**	**59.51**	**21.58**	**0.00**	**100.00**	**0.00**
Gujarat state	6.02	31.41	42.20	20.37	99.16	0.83	0.01

Gandhinagar, Kheda and Ahmedabad should allocate more of their resources to buffalo hide research, while Panchmahals should allocate 46 per cent to cattle hide research, which is the highest among the districts of the Gujarat state. In the North Gujarat region, Mehsana gives the first research priority to goat hide (65.%), followed by sheep hide (31%) and buffalo hide (4%). In the South Gujarat region, about 60 per cent of its research resources should be allocated to goat hide research, while about 22 per cent to sheep hide research and there is a little priority for cattle hide research. A similar pattern of research priority should be followed in all the districts, except Dang wherein it receive zero priority.

In the wool and hair research, all the regions give the highest priority to wool production research. In the Saurashtra region, all the districts allocate nearly 100 per cent of their wool and hair research resources to sheep wool research. It is due to higher production of wool in these areas from sheep than goat hair production. In the Middle Gujarat, the district of Vadodara should give the highest priority

to goat hair research, followed by Panchmahals (17%), Ahmedabad (12%) and Kheda (5%). All the districts of the North Gujarat region should allocate their total resources of wool and hair to wool production from sheep, except Mehsana, which gives little priority (2%) to goat hair also. All the districts of South Gujarat region should allocate their total funds towards the goat hair research only, except Dang district.

Research Resource Allocation by Commodity Group

Research priority by commodity group across the districts has been presented in Table 7. The results revealed that Saurashtra and Middle Gujarat regions together demand more than 60 per cent of state milk research resources. The districts of Kachchh and Panchmahals claim the highest share each in the state milk research, followed Kheda (9%), Mehsana (8%), Sabarkantha (7%) and Banaskantha (6%).

The Middle and South Gujarat regions together claim over 80 per cent of the state meat production

Table 7. Research priority by commodity group across the districts of Gujarat

(in per cent)

Districts/zones	Milk	Meat	Eggs	Hide & skins	Draught power	Wool & hair	Total
Amreli	2.25	0.02	0.15	0.00	5.94	3.80	2.79
Bhavnagar	3.97	3.79	3.29	1.23	7.52	8.27	4.52
Jamnagar	3.03	2.97	0.38	6.34	8.98	5.31	3.94
Junagadh	5.46	3.32	1.05	5.82	7.32	2.17	5.70
Kachchh	11.42	0.37	2.22	0.00	13.16	64.55	11.64
Rajkot	3.74	2.54	0.85	2.10	9.49	4.93	4.61
Surendranagar	2.48	0.13	0.06	0.20	8.21	2.85	3.33
Saurashtra zone	**32.35**	**13.13**	**8.00**	**15.69**	**60.62**	**91.88**	**36.54**
Ahmedabad	3.41	7.25	4.04	13.84	4.43	0.75	3.60
Gandhinagar	2.26	0.33	1.12	0.06	0.23	0.46	1.92
Kheda	8.77	19.76	17.47	9.75	2.83	0.67	7.98
Panchmahals	11.50	8.51	15.80	9.82	4.47	0.30	10.39
Vadodara	5.40	3.38	2.87	5.31	5.70	0.05	5.40
Middle Gujarat zone	**31.34**	**39.24**	**41.30**	**38.77**	**17.67**	**2.24**	**29.29**
Banaskantha	6.31	2.15	2.50	0.00	3.35	3.35	5.79
Mehsana	7.93	1.25	1.84	1.97	3.03	1.09	7.07
Sabarkantha	6.81	2.92	2.05	0.00	3.03	0.94	6.15
North Gujarat zone	**21.06**	**6.32**	**6.38**	**1.97**	**9.40**	**5.38**	**19.01**
Bharuch	4.21	5.39	3.47	6.80	6.71	0.07	4.60
Dang	0.27	0.94	5.43	0.00	1.25	0.00	0.46
Surat	6.27	18.72	15.21	30.70	2.91	0.35	5.90
Valsad	4.51	16.27	20.22	6.07	1.44	0.08	4.21
South Gujarat zone	**15.25**	**41.32**	**44.32**	**43.58**	**12.31**	**0.51**	**15.17**
Gujarat	100	100	100	100	100	100	100

research resources. Among different districts, the order of meat production research priority should be: Kheda > Surat > Valsad > Panchmahals > Ahmedabad > Bharuch.

In the egg production research, South Gujarat region receives the highest priority, followed closely by the Middle Gujarat region. Saurashtra and North Gujarat regions together claim less than 15 per cent of the state egg production research resources. District-wise, Valsad district demands the highest research resources (20%), followed by Kheda, Panchmahals and Surat.

Research on skin and hide should be targeted by the Middle and South Gujarat regions only; these together demand more than 80 per cent of state research resources this area. Among the districts, highest priority should be given to Surat (31%), followed by Ahmedabad (14%), Panchmahals (10%), Kheda (10%), Bharuch (7%) and Jamnagar (6%).

The draught power research should be targeted by the Saurashtra region and the districts therein, namely Kachchh (13%), Rajkot (9%), Jamnagar (9%) and Surendranagar (8%). Bharuch and Vadodara are the other districts which demand more draught power research in the state.

The maximum allocation for wool and hair research should be done to the Saurashtra region, in which Kachchh district claims the lion's share of about 65 per cent. The highest priority in this region is mainly due to its high share in wool production.

The research priority by commodity groups in different species across districts was also studied and the details can be obtained from the authors.

Conclusions

This study on setting research priority for the livestock sector in Gujarat has revealed that in the commodity priority, milk research demands the highest priority (83%) in the state, followed by draught power (15%), meat (1%) and egg (1%). The share of skin and hair & wool research has been found very low. Within milk research, buffalo milk

has acclaimed the highest priority in all the districts as well as the state. The poultry meat has claimed the highest share in meat research in most of the districts. The hide research in the state should focus on goat hide in the most of the districts. Wool research has got the highest priority in the Saurashtra, Middle and North Gujarat regions, while the South Gujarat region should focus on goat hair research.

In the commodity research priority, milk has claimed the highest priority in all the districts, followed by draught power and meat. Research on skin & hide, wool & hair and egg has received very low priority in most of the districts. Milk research should be targeted by districts of Panchmahals, Kachchh, Kheda, Banaskantha, Mehsana, Sabarkantha and Surat. For meat production research, a higher priority should be given to the districts in South and Middle Gujarat regions, viz. Kheda, Surat, Valsad, Ahmedabad and Panchmahals. Egg production research activities should be concentrated mainly in the districts of Valsad, Kheda, Panchmahals, Surat and Dang. In the South and Middle Gujarat regions, the districts of Jamnagar and Junagadh have appeared as the priority areas for skin research. Draught power research should largely be confined to the Saurashtra region. For the wool and hair research, Kachchh district should receive the highest priority.

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