Table S3 Description of patterns of welfare indicators with their scores.

Indicator	Description of patterns	Score
Housing system and availability of floor space	Loose system of housing with more than the recommended space both in covered and open areas. Cubicles in covered area for resting of individual cows of recommended dimensions with mattresses/sand beds. Open area containing good shady trees in sufficient numbers both inside and around the sheds with access to a grazing area for a few hours daily	10
	Loose system of housing with provision of recommended covered and open loafing area with cubicles and/ or trees inside the open area. No access to a grazing area	8
	Loose system of housing with provision of recommended covered floor space and open loafing area without cubicles but with trees inside the open area	6
	Tie barns with adequate area for feeding and resting with more than 6ft length of tie ropes/chains. Limited access to open yard for socializing and exercise or loose house with only covered area and limited access to free movement to pond/canal/ grazing field	4
	Loose house with less than recommended covered only. No access to an open area for free movement or for grazing	2
	Tie house with less than recommended covered area and less than 6ft long rope /chain for tying, not enough to move around. Cows show difficulty in lying down or getting up. No access to an open area for free movement	0
Type and height of roof	Roofing material consisting of insulated metal sheets painted white on top and black beneath or cement concrete or tiled roof with recommended height of about 15-20 feet	3
	Roofing material consisting of cement concrete/ tiles/wooden/ or good quality thatch with a height between 10-15 feet	2

	Use of asbestos or GI sheets as roofs or any other poorly insulated material. Less than 10 feet high.	1
	Non-availability of any good roofed area. Animals are herded in an open enclosure with or without a tree	0
Type of floor	The floor is concrete (RCC or brick paved) inside the covered area. Grooved and non-slip. Open drain of recommended size and slope for good drainage present. The floor in the open area is sand bedded or is well maintained in kutcha /dry earthen without pits or there is use of rubber mats or any other locally available good bedding material over concrete floors in the open area.	2
	Floors in both the covered and open areas either RCC or brick paved. Non-slip surface. Well drained with occasional use of bedding OR the floor is kutcha both inside the covered area and in the open area but is kept clean and dry most of the time with good drainage	1
	The floor is completely concrete inside the covered area as well as in open area which is non-grooved and is slippery without good drainage	0
Microclimate protection measures inside animal houses and other practices for protection against heat and cold stress	Provision of cooling during summers such as by installation of ceiling fans and mist cooling/ sprinkler system/ dessert coolers. Protection from cold, especially for young stock. Plantation of good shady trees in open area as well as on the periphery of the farm	5
	Use of ceiling fans inside covered area during summers with good shady trees in loafing area. Bathing of cows 2-3 times daily during summers or wallowing in a pond with fresh water or in canal. Suitable protection measures against cold drafts in winter	4
	Use of ceiling fans inside covered area during summers with no trees in loafing area. Bathing of cows 2-3 times daily during summers or	3

	wallowing in a pond or in canal. Suitable protection measures against cold drafts in winter	
	Keeping the cows inside the covered area during daytime and in the open area during the night in summers and vice-versa in winters. Occasional bathing and no use of any other special summer/winter protection measure	2
	Protection from direct sunlight by keeping the cows inside the covered area during day time and in the open area during night in summers and vice-versa in winters. No facility for animal bathing or wallowing and no use of any other special summer/winter protection measures	1
	No suitable covered area for protection from direct sunlight in summers or during the winter from cold or rain. Animals remain in varying degrees of heat or cold stress throughout the year	0
Feeding and watering space availability, feeding and watering systems with frequency	Fence-line feeding system (post and rail feed barrier with partitions for individual animals); availability of separate water troughs with recommended dimension; length of feeding and watering space as per BIS housing specifications with *ad libitum* access to drinking water	5
	Existence of fence-line feeding system (post and rail without partitions) and water troughs but not conforming to recommended dimensions and with lower length of feeding and watering space	4
	Feeding from elevated traditional mangers of recommended dimensions and availability of feeding space per animals as per BIS recommendations with *ad libitum* access to drinking water	3
	Feeding from elevated traditional mangers not conforming to recommended dimensions. Length of feeding manger is less than BIS recommendations resulting in competition at manger. Restricted access to drinking water	2

	Elevated traditional mangers not conforming to recommended dimensions with crowing at mangers and water offered 2-3 times a day from a tap /trough/ pond/canal	1
	Feeding from very high or very low troughs from ground level resulting in feed wastage and competition among animals at mangers. Water offered 1-2 times a day from a hand pump/ /trough/ pond/canal	0
Availability of milking parlour and water for bathing cows, udder washing, cleaning of milking utensils and availability of lighting	Milking is done in a standard milking parlour, closed from all sides and which is well ventilated, well-lit with availability of fresh water for washing of cows, udder washing, cleaning of milking utensils and sanitisation of the parlour after milking	5
	Milking is done in a milking parlour under a roofed area only which is well lit with availability of fresh water for washing of cows, udder washing, cleaning of milking utensils and sanitisation of the parlour after milking	4
	Milking is done in an improvised milking parlour under a roofed area only with availability of water for udder washing, cleaning of milking utensils and sanitisation of the parlour after milking	3
	There is no separate milking parlour but the milking is done by machine at a separate place within the usual cow shed in one side of shed on a concrete floor which is cleaned before every milking. Water is available for udder washing, cleaning of utensils etc.	2
	There is no separate milking parlour. The milking is done by hand or by machine within the usual cow shed where the cows are fed. Water is available for udder washing, cleaning of utensils etc.	1
	There is no milking parlour. The milking is done in the cows sheds itself where they usually feed and live after tying them individually. Limited water is available only for the washing of cow teats before milking.	0
Availability of quality feeds and fodders	Good quality abundant fresh seasonal green fodders, dry fodders and silage, moisture and mould free compound concentrate mixture as per the nutritional requirements of the animals along with area specific	10

	mineral mixtures available for feeding different categories of animals year-round	
	Good quality fresh seasonal green fodders and dry fodders available and the compound concentrate mixture as per the nutritional requirements of the animals for feeding different categories of animals year-round	8
	Green fodders availability in rabi (summer) and kharif (winter) crop seasons only and dry fodders are available in abundance. Compound concentrate mixture purchased for feeding all animals as per their needs.	6
	Dry fodders available in abundance with limited availability of green fodders during crop seasons. Concentrate mixture is home-made with available grains and cakes with little regard for nutritional needs of different animals.	4
	Mostly dry fodders are available. The limited amount of concentrate mixture is home-made using grains and cakes with little regard of its nutritional value. Limited availability of green fodders. Concentrate feed is fed only to the lactating cows	2
	Mostly dry fodders are available with seasonal availability of green fodders and limited grazing on common lands with meagre availability of concentrate feeds.	0
Availability of feeds and fodder storage/preservation space	Sufficient separate storage space for storing dry fodders, raw concentrate ingredients and finished concentrate mixture and silage trenches available for storing feed materials for at least 6 months.	5
	Limited storage space for storing dry fodders, raw concentrate ingredients and finished concentrate mixture. Silage trenches available for storing feed materials for 3 months	4
	Storage space for storing mainly the dry fodders and separate store for concentrate mixture is available. No provision for silage or hay storage	3
	A store or shed is available storing both dry fodders and concentrate mixture	2

	A makeshift shed or a store is available for keeping dry fodders for a few days.	1
	No store is available at the farm.	0
Feeding practices for different categories of animals	Feeding of good quality *ad lib* greens, concentrate mixture and dry fodders as per the growth, production and maintenance requirements in the form of TMR to lactating as well as dry cows at least twice/thrice daily	10
	Feeding of good quality *ad lib* greens, concentrate mixture and dry fodders as per the growth, production and maintenance requirements of lactating as well as dry cows at least twice/thrice daily	8
	Feeding with available seasonal green fodders with *ad lib* feeding of dry fodders along with balanced concentrate mixture fed twice a day to all categories of animals	6
	Feeding of seasonal greens and dry feed to all categories of animals with homemade concentrate mixture (only grains with some amount of cakes) to all the animals	4
	Feeding predominantly with dry fodders with limited availability of green fodders and homemade concentrate mixture to only the lactating animals	2
	Feeding with dry fodders/crop residues with limited availability of greens fodders and limited feeding of concentrate mixture mostly to lactating animals	0
Colostrum and milk feeding to male and female calves	The calves allowed restricted suckling of colostrum from their mothers as early as possible after birth as per standard recommendations at least 3-4 times daily for 4-5 days. Restricted suckling of milk allowed for at least 4 months to meet nutritional needs of the calf	5
	Colostrum is offered to calves within an hour of their birth as per recommendations for 2-3 times daily through natural suckling for 4-5 days**.** Restricted suckling of milk allowed for at least 3-4 months to meet nutritional needs of the calf	4

	Colostrum is offered to calves after 2-3 hours of their birth as per recommendations twice daily through natural suckling for 4-5 days. Restricted suckling of milk allowed for at least 3-4 months with little regard to the calves nutritional needs	3
	Weaning at birth and fed colostrum as per recommendations using bottle/pail within 2-3 hr of birth for 4-5 days two/three times per day. . Calves offered measured amount of milk through bottle /pail for 3-4 months	2
	Weaning at birth and fed colostrum twice daily for 3-4 days from a pail. Little regard for recommendations. Pail fed milk twice daily. amount of milk offered may barely meet their nutritional requirements.	1
	The first feeding of colostrum to calves delayed up to the release of placenta and then limited amount of colostrum is fed for 2-3 days from pail at ground level. The calves are pail fed milk twice daily; the amount of milk offered may not meet their nutritional requirements.	0
Average productivity	Average milk yield (wet average) of milking cows on the day of farm visit is between 17-20 kg or average total lactation yield is between 5000- 6000 kg	8
	Average milk yield (wet average) of milking cows on the day of farm visit is 14-16 kg or average total lactation yield is 4000- 5000 kg OR average milk yield (wet average) of milking cows on the day of farm visit is 21-25 kg or average total lactation yield is 6000- 7000 kg	6
	Average milk yield (wet average) of milking cows on the day of farm visit is 10-13 kg or average total lactation yield is 3000- 4000 kg OR average milk yield (wet average) of milking cows on the day of farm visit is 26-30 kg or average total lactation yield is 7000- 8000 kg	3
	Average milk yield (wet average) of milking cows on the day of farm visit is less than 10 kg or average total lactation yield is less than 3000 kg OR average milk yield (wet average) of milking cows on the day	0

	of farm visit is more than 30 kg or average total lactation yield is more than 8000 kg	
Body condition score (BCS) (Sprecher *et al.*, 1997)	If > 80 % lactating cows have BCS of 3-3.5	4
	If between 60- 80 % lactating cows have BCS of 3-3.5	3
	If between 40-59 % lactating cows have BCS of 3-3.5	2
	If between 20-39 % lactating cows have BCS of 3-3.5	1
	If < 20 % lactating cows have BCS of 3-3.5	0
Cow comfort index (Cook *et al.*, 2004)	Proportion of cows lying down to total cows in the pen, if between 80-100 %	5
	Proportion of cows lying down to total cows in the pen, if between 60-79 %	4
	Proportion of cows lying down to total cows in the pen, if between 40-59 %	3
	Proportion of cows lying down to total cows in the pen, if between 20-39 %	2
	Proportion of cows lying down to total cows in the pen, if between 0-19 %	1
Cow cleanliness score (CCS) (Napolitano *et al.,* 2005)	If > 80 % lactating cows have CCS of 5	4
	If between 60- 80 % lactating cows have CCS of 5	3
	If between 40-59 % lactating cows have CCS of 5	2
	If between 20-39 % lactating cows have CCS of 5	1
	If < 20 % lactating cows have CCS of 5	0
Hock injury score (HIS) (University of Minnesota, 2011)	If > 80 % lactating cows have HIS of 4	3
	If 60- 80 % lactating cows have HIS of 4	2
	If 40-59 % lactating cows have HIS of 4	1
	If < 40 % lactating cows have HIS of 4	0
	Animals that can be touched	3

Human-animal relationship (Waiblinger *et al.,* 2003)	Animals that can be approached as closely as 50 cm but not touched	2
	Animals that can be approached as closely as 100-50 cm	1
	Animal that cannot be approached as closely as 100 cm	0
Lameness score (LS) (Flower and Weary, 2006)	If > 80 % lactating cows have LS between 1-2	4
	If between 60- 80 % cows have LS between 1-2	3
	If between 40-59 % cows have LS between 1-2	2
	If between 20-39 % cows have LS between 1-2	1
	If < 20 % cows have LS between 1-2	0
Breeding practices	All cows are bred under a pre-defined breeding policy by artificial insemination using semen of progeny tested bulls of the particular breeds	4
	The cows are bred by artificial insemination with selected bull semen	3
	The cows are bred by artificial insemination with any available bull semen	2
	The cows are bred via natural mating with a selected bull	1
	The cows are bred via natural mating with any available bull	0
Reproductive efficiency	When the milking to dry cow ratio on the day of farm visit is between 75:25 to 80:20	3
	When the milking to dry cow ratio on the day of farm visit is between 65:35 to 75:25	2
	When the milking to dry cow ratio during on the day of farm visit is less than 55:45 to 65:35	1
	When the milking to dry cow ratio on the day of farm visit is less than 55:45	0
Abnormal behaviours	If less than 5 % cows show all abnormal behaviors	2
	If 5-10 % lactating cows show all abnormal behaviors	1
	If > 10 % lactating cows show all abnormal behaviors	0

Table S5 Average scores of welfare indicators in different sized farms in Punjab.

Sr. No.	Welfare indicator	Welfare score assigned	Farm size category			Overall
			Small	Medium	Large	
Component A. Housing and other facilities						
1	Housing system and availability of floor space	10	5.30^{a}±0.71	4.90^{a}±0.70	6.10^{b}±0.59	5.43±0.39
2	Type and height of roof	3	2.45^{a}±0.11	2.80^{b}±0.09	2.75^{b}±0.10	2.67±0.06
3	Type of floor	2	0.90±0.18	1.10±0.18	0.70±0.11	0.90±0.09
4	Microclimate protection measures	5	1.60^{A}±0.21	2.70^{B}±0.33	4.40^{C}±0.21	2.90±0.21
5	Availability of feeding and watering space and associated practices	5	3.30±0.16	3.10±0.10	3.40±0.18	3.27±0.09
6	Availability of milking parlour with water and light	5	1.00^{A}±0.00	1.50^{AB}±0.29	2.70^{B}±0.44	1.73±0.19
	Sub-total	**30**	**14.55^{a}±0.94**	**16.10^{a}±0.87**	**20.05^{b}±0.88**	**16.90±0.54**
Component B. Feeds and feeding practices						
7	Availability of feed and fodder	10	7.10^{a}±0.34	7.70^{ab}±0.16	7.90^{b}±0.10	7.57±0.14
8	Availability of feed and fodder storage space	5	3.10^{A}±0.34	4.05^{AB}±0.34	4.80^{B}±0.14	3.98±0.19
9	Feeding practice of different categories of animals	10	7.50^{A}±0.61	9.10^{B}±0.34	9.90^{B}±0.10	8.83±0.27
10	Colostrum and feeding of milk to calves and heifer feeding	5	4.20±0.37	4.80±0.14	4.80±0.14	4.60±0.14
	Sub-total	**30**	**21.90^{A}±1.23**	**25.65^{B}±0.74**	**27.40^{B}±0.29**	**24.98±0.56**
Component C. Animal health, performance and behaviour						
11	Average productivity	8	4.55^{A}±0.56	5.50^{AB}±0.47	6.65^{B}±0.29	5.57±0.28
12	Body condition score	4	1.90^{a}±.025	2.05^{ab}±0.14	2.55^{b}±0.15	2.17±0.11
13	Cow comfort index	5	3.50±0.29	4.15±0.20	3.90±0.16	3.85±0.13
14	Cow cleanliness index	4	0.20±0.12	0.50±0.15	0.30±0.11	0.33±0.07
15	Hock injury scoring	3	2.70^{a}±0.11	2.80^{ab}±0.09	3.00^{b}±0.00	2.83±0.05
16	Human-animal interaction	3	2.55±0.14	2.40±0.13	2.30±0.13	2.42±0.08
17	Lameness scoring	4	3.60±0.17	3.75±0.16	3.95±0.05	3.77±0.08

18	Mastitis incidence	4	2.85±0.41	2.40±0.38	2.95±0.29	2.73±0.21
19	Reproductive efficiency	3	1.10^{A}±0.18	1.70^{AB}±0.18	2.05^{B}±0.17	1.62±0.11
20	Abnormal behaviours	2	1.40±0.21	1.40±0.21	1.50±0.18	1.43±0.11
	Sub-total	**40**	**24.35^{A}±1.33**	**26.65^{AB}±1.08**	**29.15^{B}±0.88**	**26.72±0.68**
	Overall total welfare score	**100**	**60.80^{A}±2.77**	**68.40^{AB}±2.27**	**76.60^{B}±1.70**	**68.60±1.49**

The values with different superscripts (a, b, c at $P < 0.05$) and A, B, C at $P < 0.01$) in rows differ significantly

Table S6 Average scores of welfare indicators in different sized farms in Haryana.

Sr. No	Welfare indicator	Maximum score	Farm size category			Overall
			Small	Medium	Large	
Component A. Housing and other facilities						
1	Housing system and availability of floor space	10	6.10^{b} ±0.37	5.80^{b}±0.50	7.00^{a}±0.45	6.30±0.36
2	Type and height of roof	3	2.30^{a} ±0.16	1.75^{b}±0.10	2.50^{a}±0.27	2.18±0.22
3	Type of floor	2	1.15^{b} ±0.13	1.40^{a}±0.27	1.40^{a}±0.22	1.32±0.08
4	Microclimate protection measures	5	2.50^{b} ±0.25	2.70^{b}±0.33	3.60^{a}±0.31	2.93±0.34
5	Availability of feeding ,watering space and associated practices	5	1.90^{b} ±0.27	1.90^{b}±0.31	2.80^{a}±0.47	2.20±0.30
6	Availability of milking parlour with water and light	5	1.40^{b} ±0.18	2.10^{b}±0.22	3.10^{a}±0.43	2.20±0.49
	Sub-total	**30**	**15.35±0.74**	**15.00 ± 066**	**20.40±0.78**	**17.13±1.64**
Component B. Feeds and feeding practices						
7	Availability of feed and fodder	10	7.15^{a}±0.36	7.15^{a}±0.30	8.40^{b}±0.40	7.57±0.42
8	Availability of feed and fodder storage space	5	2.90^{a}±0.23	2.75^{ab}±0.41	3.70^{b}±0.52	3.12±0.29
9	Feeding practice of different categories of animals	10	6.85±0.39	7.00±0.37	7.30±0.52	7.05±0.13
10	Colostrum and feeding of milk to calves and heifer feeding	5	3.40±0.23	3.80±0.22	4.00±0.33	3.73±0.18
	Sub-total	**30**	**20.30^{a} ±1.12**	**20.70^{a} ± 1.12**	**23.40^{b} ±1.18**	**21.47± 0.97**
Component C. Animal health, performance and behaviour						
11	Average productivity	8	4.85±0.41	4.85±0.36	5.23±0.93	4.98±0.13
12	Body condition score	4	2.80^{a}±0.25	2.00^{b}±0.21	2.20^{b}±0.33	2.33±0.24
13	Cow comfort index	5	3.20^{ab}±0.31	2.80^{a}±0.19	3.13^{b}±0.50	3.04±0.12
14	Cow cleanliness index	4	2.70^{a}±0.29	2.30^{a}±0.27	1.75^{b}±0.23	2.25±0.28
15	Hock injury scoring	3	2.05±0.18	2.15±0.18	2.14±0.34	2.11±0.03
16	Human-animal interaction	3	2.10^{a}±0.20	1.80^{b}±0.26	1.71^{b}±0.41	1.87±0.12
17	Lameness scoring	4	3.70±0.16	3.65±0.17	3.33±0.49	3.56±0.12

18	Mastitis incidence	4	1.65^{a}±0.25	1.70^{a}±0.24	2.09^{b}±0.33	1.81±0.14
19	Reproductive efficiency	3	1.50±0.21	1.60±0.18	1.54±0.30	1.55±0.03
20	Abnormal behaviours	2	0.30^{a}±0.13	0.15^{a}±0.08	1.17^{b}±0.36	0.54±0.32
	Sub-total	**40**	**24.85±0.40**	**23.00 ± 0.40**	**24.30 ± 0.38**	**24.05± 0.55**
	Overall total welfare score	**100**	**60.50^{b} ± 2.74**	**59.35^{b} ± 2.17**	**68.1^{a} ± 1.18**	**62.65±2.02**

The values with different superscripts (a, b, c at $P < 0.05$) and A, B, C at $P < 0.01$) in rows differ significantly

Figure S2 Dry sand-bedded open loafing/resting area adjacent to the cow shed at a large farm.

Figure S3 Tie-house with inadequate height and concrete flooring at a small farm.

Figure S6 Availability of silage bags at a large farm.

Figure S7 Dry fodder (wheat straw) store at a large farm.

Figure S10 Poor cleanliness of cows due to overcrowding, concrete flooring and infrequent removal of dung and urine at a small farm.

Figure S11 Unhygienic floors in pen resting area seen at most dairy farms, leading to poor cow cleanliness.