Livestock and Poultry Production Policy for Andaman and Nicobar Islands :

A scientific perspective

A. Kundu
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S. Jeyakumar
S. K. Verma
M. S. Kundu
A. K. De
R. C. Srivastava

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FOREWORD

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India has vast resource of livestock and poultry, which play a vital role in improving the socioeconomic condition and National economy. The island agriculture and animal husbandry activities are barely 150 years old. Till late 18th century islands were inhabited by only native tribal and the major food animals was pigs and birds. With the settlement of penal colony by Britishers, livestock farming came in existence to meet out the demand of meat and milk.

The island is endowed with rich faunal diversity and among them the farm animal genetic resources comprises of cattle, goat, buffalo, pig and poultry. Among them the Nicobari fowl, Teresa goat, Nicobari pig are the important indigenous germplasm of the island.

The challenges ahead for the institute and the administration to address the major issues keeping in mind the growing population and the tourism sector. Now it is high time to redesign the livestock and poultry production strategies to meet out the requirement of meat, milk and egg.

In the brain storming session all the eminent scientific, technocrats and bureaucrats discussed on important aspects of livestock sector and come out with valuable implementable policies and recommendations towards sustainable development of livestock sector in the islands. The authors thank all the participants for their valuable contribution for bringing out this doucument.

20 July 2010
Port Blair

Authors

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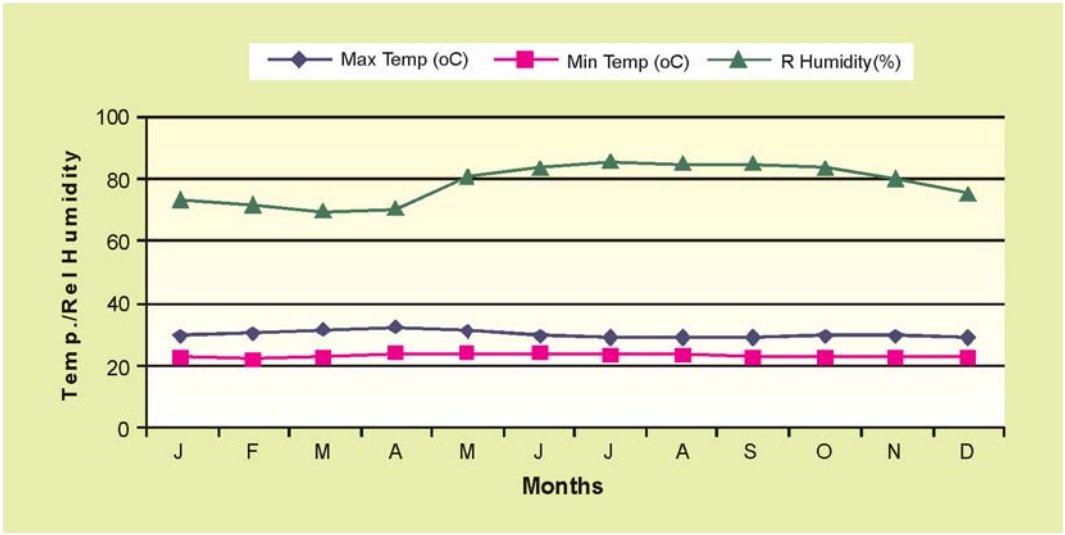
1.1 TOPOGRAPHY AND CLIMATE OF A & N ISLANDS

The Andaman & Nicobar Islands are a group of 572 big and small Islands & Islets in the South Eastern part of Bay of Bengal. The total geographical area is about 8249 sq. km, out of which about 86 % (7171 kms^2) is covered by forest. The total area of Andaman covers 6340 sq. kms and Nicobar group covers 1841 sq. kms. Only about 53734 ha of land are available for habitation and agriculture. The total aggregate coastline is about 1912 kms, which is about a fourth of coastline of India. The Exclusive Economic Zone (EEZ) is about 0.6 million Sq km, which is about 30% of the EEZ of India. The main economic activities of the people here are Agriculture, Animal Husbandry, Fishery, Tourism related activities and Services.

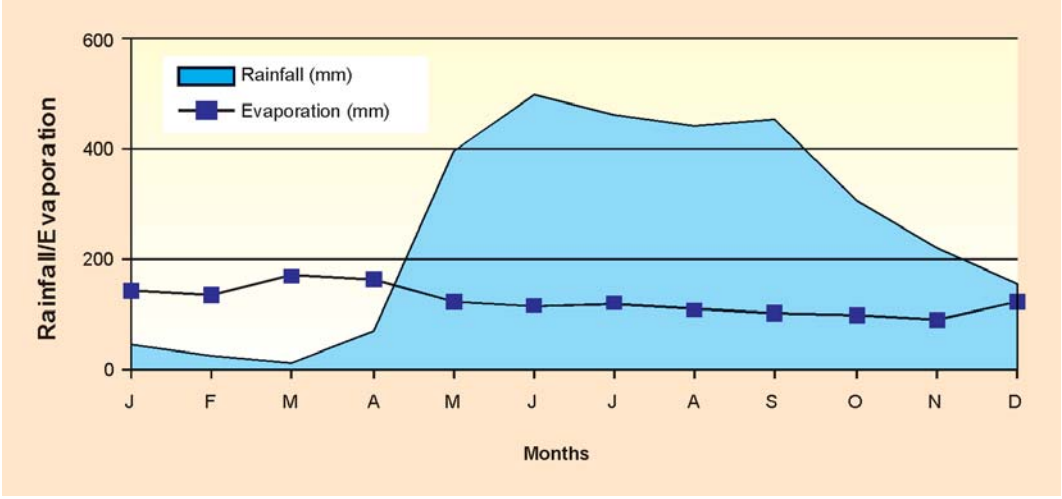
Climate

The temperature varies from 27^0 C to 30^0 C. The annual rainfall is about 3100 mm and it enjoys a tropical hot and humid climate. Intense solar radiation is observed between February to April. Temperature and humidity pattern of a year is given below:



Rainfall pattern

The Islands receives South West monsoon from May to September and North East Monsoon from October to December. The average annual rainfall is 3155 mm. The islands lack well demarcated seasons but can be loosely classified into two i.e. rainy months (May to November) and dry months (December to April). The rainy days in a month extends from 0 to 30 days.



Month wise weather data (mean) from 1985 - 2006

Month	Temperature (°C)		Rainfall (mm)	Relative humidity (%)		
	Min.	Max.		Morn.	Even.	Avg.
January	22.4	29.6	35.5	73	75	74
February	22.0	30.4	10.5	71	72	72
March	22.8	31.3	36.2	70	73	71
April	24.0	32.3	69.7	70	74	72
May	24.2	31.0	371.7	78	82	80
June	24.2	29.7	446.2	83	85	84
July	23.7	28.9	423.8	84	85	84
August	23.5	29.1	448.9	84	86	85
September	23.0	29.0	471.6	84	87	86
October	23.2	29.7	303.8	81	86	84
November	23.8	29.8	247.0	78	81	79
December	23.1	29.6	76.6	73	76	74

Year wise weather data (mean) from 1985 - 2006

Year	Temperature (°C)		Rainfall (mm)	Relative humidity (%)		
	Min.	Max.		Morn.	Even.	Avg.
1985	23.3	29.8	2828.2	77	79	78
1986	22.9	29.9	2197.8	76	79	78
1987	22.9	30.2	2835.4	77	79	78
1988	21.6	29.8	3364.9	78	80	79
1989	20.4	29.6	2641.7	78	79	79
1990	24.0	29.9	2593.7	79	81	80
1991	23.7	30.0	3096.9	77	79	78
1992	23.1	29.6	2793.6	76	80	78
1993	24.0	30.0	2542.9	75	78	77
1994	23.8	30.1	3512.4	77	80	79
1995	23.8	30.2	3358.4	78	80	79
1996	23.6	30.0	3473.1	78	82	80
1997	23.1	30.3	2795.8	76	79	77
1998	23.2	30.6	2811.5	78	81	79
1999	22.8	29.8	2975	79	82	81
2000	23.3	29.9	2947.4	79	81	80
2001	23.5	30.2	3113.4	78	81	80
2002	23.5	30.5	2617.4	77	81	79
2003	24.2	30.4	2243	77	80	78
2004	24.2	30.5	3188.7	76	79	78
2005	24.3	29.7	3773.8	77	80	79
2006	24.0	29.8	3004.2	78	81	79

1.2 AREA AND POPULATION

The total geographical area of A&N Islands is 8,249 sq km. The forests in A&N Islands occupy about 86 percent of the total geographical area. Remaining area is available for agriculture and allied activities. The area of Andaman group of islands is 6,408 sq km whereas the Nicobar group of islands is 1,841 sq km. The total population in these islands is about 3,56,152 (Population Census, 2001) with a growth rate of about 26.9 percent in the last decade. Assuming the population growth rate

as in the last decade, it is projected that the population in these islands will increase to nearly 5,73,500 in 2021, with nearly 55 percent population living in rural areas. Out of 572 islands, 38 are inhabited in which 25 are in Andaman group and 13 are in Nicobar group of Islands. It is interesting to note that inhabited islands encompass about 94 percent of the geographical area of A&N Islands.

Table: Area and population in different districts and blocks in A&N Islands

Districts	Blocks	Area (km^2)	Population (2001 Census)
Andaman	Port Blair	2,021	1,42,317
	Ferrargunj	1,085	48,626
	Little Andaman	—-	17,528
Nicobar	Car Nicobar	129	20,292
	Nancowry	1,712	13,472
	Campbell bay	—-	8,214
North & Middle	Diglipur	884	42,877
Andaman	Mayabunder	1,348	23,912
	Rangat	1,070	38,824

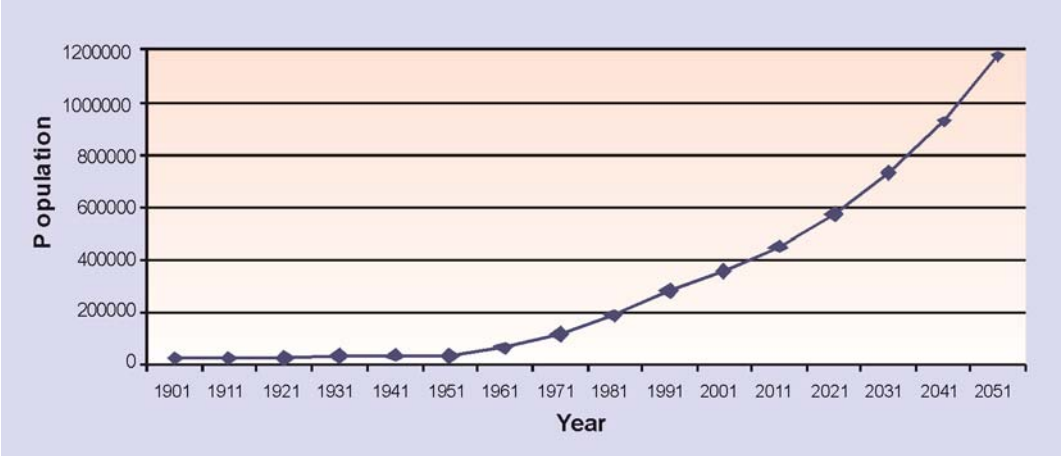


Fig: Trend of population growth and projected population in A&N Islands

Table: Area, population and density in inhabited islands of the Andaman group

Sl. No.	Geographical Name	Area(km^2)	Population (2001 census)	Density (person/km^2)
1.	Aves	0.20	2	10.0
2.	Baratang	297.80	6,062	20.4
3.	Cinque	9.53	6	0.6
4.	Curlew	0.03*	2	66.7
5.	East	6.10	17	2.8
6.	Flat Bay	0.14	10	71.4
7.	Havelock	113.90	5,354	47.0
8.	Interview	133.40	16	0.1
9.	John Lawrance	41.98*	25	0.6
10.	Little Andaman	731.60	17,528	23.9
11.	Long	17.90	2,199	122.8
12.	Middle Andaman	1535.50	54,385	35.4
13.	Narcondam	6.80	17	2.5
14.	Neil	18.90	2,868	151.7
15.	North Andaman	1376.00	42,163	30.6
16.	North Passage	22.00	11	0.5
17.	North Sentinal	59.67*	39	0.7
18.	Ross	0.65*	Nil	-
19.	Rutland	137.20	688	5.0
20.	Smith	24.70	676	27.3
21.	South Andaman	1347.97*	1,81,949	134.9
22.	Spike	11.70	19	1.6
23.	Stewart	7.20	2	0.3
24.	Strait	6.00	42	7.0
25.	Viper	0.50	4	8.0
	Total	**5907.37**	**3,14,084**	**53.1**

(* Forest Statistics, 2000-01)

Table: Area, population and density in inhabited islands of the Nicobar group

Sl. No.	Geographical Name	Area(km^2)	Population (2001 census)	Density (person/km^2)
1.	Car Nicobar	126.9	20,292	159.9
2.	Chowra	8.2	1,385	168.9
3.	Teressa	101.4	2,026	20.0
4.	Bompuka	13.3	55	4.1
5.	Katchal	174.4	5,312	30.5
6.	Kamorta	188.2	3,412	18.1
7.	Nancowry	66.9	927	13.8
8.	Trinket	86.3	432	5.0
9.	Little Nicobar	159.1	348	2.1
10.	Pillomilo	1.3	150	115.4
11.	Kondul	4.6	150	32.6
12.	Great Nicobar	1045.1	7,566	7.2
13.	Thillangchong	16.8	-	-
	Total	**1841**	**42,068**	**22.9**

1.3 BIODIVERSITY, CONSERVATION AND MANAGEMENT OF GENETIC RESOURCES OF LIVESTOCK AND POULTRY

Ecologically, high level of endemism prevails in these islands. Overall, 9 per cent of the fauna is endemic, 40 per cent of the 244 species and subspecies of birds are endemic. In mammals, 60 per cent of the 58 species are endemic. The A&N Islands supports a significant diversity of reptile and amphibians with a high level of endemism. Currently seven amphibians and 16 reptile species are endemic to the Andamans and two amphibians and 15 reptiles are endemic to the Nicobars. About 14 percent of the angiosperm species, representing 700 genera and belonging to 140 families, are endemic to the islands. Among the non-endemic angiosperms about 40 percent are not found in mainland India, but have only extra-Indian distribution in South East Asia. The butterfly diversity and endemism is also very high, of the 214 species and 236 subspecies in 116 genera of which over 50 percent are endemic.

The diversity of livestock genetic resources is very wide, both in variety and variability in terms of species, breeds, populations and unique genotypes. This diversity has been recognized as a vital resource for sustenance of mankind.

Judicious utilization and enhancement of the quality of these resources is important to ensure their sustainability to meet future demands. Main livestock in these islands are cattle, buffalo, goat, pig, poultry, a few elephants and rabbits also. Out of 36 islands, 12 islands have no livestock what so ever and another 4 islands have a population less than 200 numbers. The North, South and Middle Andaman have major chunk of livestock in Andaman group of islands and Car Nicobar, Katchal are the centers having more concentration of livestock in Nicobar group of islands. At the same time cattle, buffalo and goat are the predominant livestock species in Andaman group of islands where as pig and goat are dominant in Nicobar Islands. This distribution clearly points out the food habits of people in the two regions.

Cattle and Buffalo

Three genetic groups of cattle are available in these islands namely-

a. Local cattle

b. Trinket cattle

c. Crossbred cattle (cross of local cattle with Jersey / Holstein)

Local cattle

The local cattle of Andaman are nondescript and represent an admixture of different breeds that were brought to these islands in different phases of inhabitation and rehabilitation of migrated people. The inheritance from Red Sindhi, Sahiwal and Haryana could be traced. The cows are moderate in size. The adult body weight is about 200-300 kg. The body colour are white, black, red or admixture of all these. They are humped cattle (*Bos indicus*), teats and udder are small in size and the stature is stout. The local cattle are well adopted to this climate. They are resistant to many bacterial, viral and parasitic diseases. They require less care and management. These cows produce around 1-3 lit of milk daily. They have 6-8 months of lactation period with longer calving interval and higher age at first calving.

Trinket cattle

This group of cattle is available in Trinket Island. Swedish people, who had settled in a part of Nancowrie group of islands, had left some cattle of exotic origin in Trinket Island. They used to rear these cows for milk. They are having good udder size and milking capacity. The udder size of these cows subsequently got reduced probably due to nonuse of these cows for milk for generations together. These cows are feral in nature.

Crossbred cattle

These are the crosses of local cattle with Jersey or Holstein-Friesian. The average daily milk yield varies between 4-5 lit. Holstein crosses are higher milk producer than Jersey crosses.

Buffalo

The buffaloes available in these islands are mongrel population, which constitutes the inheritance of Murrah, Nagpuri, Bhadawari, Marathwada and nondescript population. They are water buffaloes and poor milk producer. The herd size varies from 4 to 21.

Goat

Goats constitute 37.67% of the total livestock and are mostly owned by settlers and distributed in different island. There are five distinct population of goats are available in these islands, viz. Andaman Local Goat, Feral/semi feral goat, Teressa goat, Malabari and its crosses and recently introduced Boer goat crosses.

Majority of goats in these islands resemble **Black Bengal** and were brought from Bengal and adjacent areas in different phases of inhabitation and rehabilitation of migrated/settled people. These goats are well adapted to the island condition and are widely distributed through out Andaman Islands. These goats are locally called as Andaman Local Goat.

The second group of goat are **feral and semi feral** in nature. They are available in Barren islands. However, recent volcanic eruption after tsunami (Dec.2004) at Barren Island has created some threat to these goats and post tsunami status of these goats is not known till date.

The third group of goat is **Teresa goat**, which is found in southern group of island. Scarce population of these goats is available Nicobar and Nancowry Island. These goats generally resemble the Kambing Katchang of Indonesia and tribal community rears them for meat. These goats are semi feral in nature.

Fourth group of goat is **Malabari goat**, which was introduced from Kerala and Tamil Nadu during 7th five-year plan by the DAH&VS, A&N administration. These goats were mainly introduced for up gradation of indigenous goats.

The fifth group belongs to the cross between Andaman Local Goat (female) and Boer goat (frozen semen straw). Through A.I. technology, Division of Animal

Science, CARI had successfully produced Boer goat cross in 2006 and is being maintained and distributed to the local farmers.

All the goats available are of meat type and there is high demand for chevon in these islands. The price of the goat meat ranges between Rs.210 and 280 per kg in Port Blair which rises upto Rs. 500 per kg in Campbell Bay and this shows great demand for goat and its products. The goats constitute an important productive asset of landless, marginal, and small landholders of these islands and it generates a flow of income and employment through out the year. However, the productivity of goats is low. The various cause for low productivity could be poor germplasm, lack of sufficient breeding animals, low grazing areas, socio-economic condition of the farmers, lack of adoption of scientific farming, lack of awareness about recent technologies, poor extension support, limited commercialization of goat farming and poor marketing channel and facilities (lack of organized slaughter house). Nevertheless, there is considerable potential to enhance the productivity of goats and their economic and food security contribution for the ever-increasing population of these islands.

Pigs

Pigs constitute 27.26 per cent of the total livestock (cattle, goat and pig) and are mostly owned by tribes and settlers and distributed in Nicobar group of islands and also in different parts of Andaman Islands. There are four distinct populations of pigs available in these islands, viz. **Nicobari pig**, **Andaman Wild Pig** (Schedule II animal under Forest Act), **Local/Desi pigs**, **Large White Yorkshire** and its crosses.

Majority of the pigs belongs to indigenous Nicobari pig of Car Nicobar islands. In other areas local/desi pigs and Large White Yorkshire are available which are reared by the local settlers from Bengal, Ranchi, Burma, Tamils and other parts of Northern India. The Andaman wild pig is available in the Jarawa reserve forest area and they are short and sturdy pigs. They are being poached by the primitive Jarawa tribes. This pig is protected under Wildlife Act.

Poultry

The avifauna of Bay Islands is unique. Long period of isolation from main land has brought genetic variation in the genome of the Islands avifauna. The avifauna of these islands consist of 243 species and sub species of birds and have been classified as migrants-100, resident-43, resident (endemic)-95, introduced-5. The

British first introduced systematic poultry farming in these islands. Poultry germplasm available are mostly **non-descript** except a few indigenous birds such as **Nicobari fowl, Frizzle fowl, Naked neck, Aseel, Barred desi and Red jungle fowl.** These indigenous birds are well adapted to the Island ecosystem and survive well in free range conditions. The endangered breeds of these Islands are Nicobari fowl, Naked neck, frizzle fowl, barred desi, red jungle fowl Aseel and desi ducks. Poultry population in this region is predominantly desi i.e. non-descript about 80% and only 20 % poultry birds are high yielding or exotic breeds. The poultry population in North Andaman is 31.2% followed by Car Nicobar (21.77%), South Andaman (20.29%), Middle Andaman (10.41%) and rest of the islands have less than 10% population while seven Islands have no poultry birds.

Feed and fodder

Proper nutrition is the vital aspect in livestock production. Presently Andaman Nicobar Islands has about 173970 number livestock and 978565 number poultry. Andaman & Nicobar group of Islands has only 53000 hectare cultivable land. Out of this approximately 46,000 ha land is under agricultural crops that include about 30000 ha land under fruits and plantation crops, about 10000 ha land under field crops (about 8000 ha paddy land after tsunami) and about 461 ha land a fallow land. The cultivable fodder area is only 10 ha. The present availability of fodder is far below the requirements. In the small holder farming system prevalent in these Islands, the production of forage and fodder is often a sideline activity and not being practiced by the Island farmers as a routine. Grasses and legumes grow voluntarily on the bunds around the rice fields. Fodder shrubs and trees may or may not be present on field bunds.

1.4 STATUS OF VETERINARY SERVICES IN THE ISLANDS

The infrastructure development was initiated during the British period onward. The Britishers opened first veterinary hospital at Port Blair (Goalghar) in 1940. A very good network of veterinary hospitals (9), veterinary dispensary (11), sub-dispensaries (41), farms (6), hatchery units (4), polyclinic-cum-animal disease diagnosis laboratory, and liquid nitrogen plant have gradually come up to facilitate

Sl.	Item	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
1	Veterinary Hospitals	9	9	9	9	9	9	9	9
2	Veterinary Dispensaries	11	11	11	11	11	11	11	11
3	Animal treated	209728	200032	199869	219883	264537	212255	334060	235935
4	Private Clinic	-	-	-	-	-	-	-	-
5	Veterinary Polyclinic/ Diagnostic Lab	1	1	1	1	1	1	1	1

(Source: Economic Survey of A&N Islands, 2007-08)

1.5. POPULATION AND PRODUCTION STATUS OF LIVESTOCK AND POULTRY

Loss of livestock population during Tsunami

Livestock	Before Tsunami	Loss	% loss
Cattle/Buffalo	79,765	3786	4.75
pig	52,201	38446	73.65
Goat	79,209	16623	20.98
Poultry (including ducks)	9,30,878	98,722	10.60
Total	**11,42,063**	**1,57,577**	**13.79**

Source : DAH&VS, A&N Admn

Population status:

Sl. No.	Livestock	Census 1997 (nos)	Census 2003 (nos)	% of Growth rate over previous census	Census 2007 (nos) Prov.	% of Growth rate over previous census*
1	Cattle	60180	63554	5.61	49369	-22.32
2	Buffalo	14204	16211	14.13	10195	-37.11
3	Goat	70923	79219	11.7	66550	-15.99
4	Pig	42836	52201	21.86	47061	-9.85
5	Poultry	800950	930878	16.22	971335	4.35

*due to loss of livestock in the Tsunami devastation
Source : DAH&VS, A&N Admn

Area	Cattle population (no)	Buffalo population (no)	Goat population (no)
Port Blair Urban	1161	179	2749
Rural	7780	577	8284
Havelock	1091	167	1408
Neil Island	940	0	1957
Little Andaman	2448	0	5013
Ferrargunj Tehsil	7719	696	10479
South Andaman District	**21139**	**1619**	**29890**
Rangat Tehsil	5518	2013	7667
Mayabunder Tehsil	8031	3436	6940
Diglipur Tehsil	13852	3671	13690
M&N Andaman District	**27401**	**9120**	**28297**
Carnicobar Island	205	0	7270
Chowra Island	0	0	0
Teressa Island	14	0	114
Katchal Island	39	0	155
Nancowry Island	244	0	345
Great Nicobar	1783	22	473
Nicobar District	**2285**	**22**	**3357**
A&N Islands	**50825**	**10761**	**66544**

Source : DAH&VS, A&N Admn

Goat

Island	Census (2003)	Census (2007)	% Variation
South Andaman District			
Port Blair Urban	2975	2749	-7.6
Rural	4416	8284	87.59
Havelock	1189	1408	18.42
Neil Island	2330	1957	-16.01
Little Andaman	7158	5013	-29.97
Ferrargunj Tehsil	12863	10479	-18.53
Total	**30931**	**29890**	**-3.37**

Middle &North Andaman			
Rangat Tehsil	9871	7667	-22.33
Mayabunder Tehsil	12132	6940	-42.8
Diglipur Tehsil	10526	13690	30.06
Total	**32529**	**28297**	**-13.01**
Nicobar District			
Car Nicobar island	7884	7270	-7.79
Chowra island	109	0	0
Teressa island	3398	114	-96.65
Katchal island	2371	155	-93.46
Nancowrie island	1210	345	-71.49
Grat Nicobar	787	473	-39.9
Total	**15759**	**8357**	**-46.97**
Grand Total A&N islands	**79219**	**66544**	**-16**

artificial insemination programme. The number of animals provided treatment from the Govt. Hospitals / Dispensaries from 2000-01 to 2007-08 are indicated in the **Veterinary Services in Andaman and Nicobar Islands (unit in numbers)**

Year	Milk (000 Tonns)	Eggs (No. in Lakhs)	Meat (000 Kg)
2000-01	23.180	541.220	576.526
2001-02	24.360	549.780	658.303
2002-03	25.510	569.910	665.078
2003-04	26.420	572.070	768.788
2004-05	24.040	529.000	729.167
2005-06	20.230	476.990	289.584
2006-07	22.580	534.950	313.050
2007-08	23.890	638.940	338.840

Livestock Products

The main Livestock products are Milk, Egg and Meat. The estimated production of livestock during the period 2001-02 to 2007-08 is presented: (Source: Economic Survey of A&N Islands, 2007-08)

The production of milk has increased from 23.18 thousand tones in 2000-01 to 26.42 thousand tones in 2003-04 registering a growth rate of 13.97% during the period of four years. The milk and egg production has decreased from 2004-05 onwards due to loss of 3, 786 number Cattle/buffalo, 16, 623 numbers Goats and 98, 722 poultry during Tsunami of December 2004.

Due to sudden increase in human population thereby increase in demand for milk and milk products, meat etc in eighties; cross breeding programme and co-operative dairy movement were launched. Crossbreds witnessed exorbitant mortality rates (both calves and adults), infertility/anoestrus and poor production.

Island wise milk production status (000 t)				Rank
Island	**2007-08**	**2006-07**	**2005-06**	
Andaman District				
Narcondum	0	0	0	
East island	0	0	0	
North Andaman	3.59	6.14	6.06	III
Smith island	0	0	0	
Stewart	0	0	0	
Curlew	0	0	0	
Avis	0	0	0	
Interview	0	0	0	
Middle Andaman	6.56	3.26	2.26	II
Porlob	0	0	0	
Long	0.18	0.14	0.14	VIII
North Passage	0	0	0	
Strait	0	0	0	
Baratang	0.93	1.097	0.719	IV
Pill	0	0	0	
Havelock	0.51	0.475	0.475	VI
Jhon-Lawerence	0	0	0	
Neil	0.57	0.451	0.429	V
South Andaman	8.72	7.5	6.501	I
Rut land	0.11	0.051	0.051	
North Sentinel	0	0	0	

Little Andaman	0.5	1.487	1.487	VII
Flat bay	0	0	0	
Viper	0	0.008	0.008	
Spike	0	0	0	
Cinque	0	0	0	
Total	21.67	20.61	18.13	
Nicobar district				
Car Nicobar	0.42	0.38	0.4	II
Chowra	0.01	0	0	
Teressa	0.29	0.003	0.003	IV
Bambooka	0.02	0.002	0.002	
Katchal	0.34	0.289	0.344	III
Nancowrie	0.02	0.003	0.003	
Kamorta	0.13	0.158	0.158	V
Trinket	0.03	0.054	0.054	
Pilomilow	0	0	0	
Little Nicobar	0	0.098	0.098	
Kondul	0	0	0	
Campbell Bay	0.96	0.983	1.038	I
Total	**2.22**	**1.97**	**2.1**	
Grand Total	**23.89**	**22.58**	**20.23**	

The research support from CARI, integration with line departments made the crossbred a successful venture and laid the foundation stone of successful co-operative dairy movement in 1997-98.The crossbred animals should not go beyond 40 percent of total female population so that in subsequent generations hybrid vigour (essential for sustained production) is maintained in the population. A clear cut breeding policy needs to be devised.

Pig

Pigs are generally reared under free range and/or semi intensive system. The pigs in certain locations are integrated with various farming system i.e. Integrated farming system (IFS) for efficient utilization and recycling of natural resources. The pigs are fed with locally available feed materials viz. rice bran, maize, wheat,

coconut, taro (*Colocasia esculenta and Colocasia antiquorum*), Tapioca, kitchen/hotel waste, vegetable waste and poultry offals. However, in the Nicobar group of Islands coconut is the main feed resource for the pigs.

Comparative statement and per cent variation on pre (2003) and post tsunami (2007) status of pig population (in 000) in A&N Islands

Name of islands/ Loations/place	Population as per the 17th Livestock Census - 2003	Population as per the 18th Livestock Census - 2007	Per cent variation
SOUTH ANDAMAN DISTRICT			
Port Blair			
Urban area	83	87	4.82
Rural area	102	56	-45.10
Havelock Island	45	175	288.89
Neil Island	4	18	350.00
Little Andaman Island	1089	1317	20.94
Ferrargunj Tehsil	239	225	-5.86
Total	**1562**	**1878**	**20.23**
MIDDLE AND NORTH ANDAMAN DISTRICT			
Rangat tehsil	1374	2332	69.72
Mayabunder tehsil	1518	2512	65.48
Diglipur tehsil	4063	5978	47.13
Total	**6955**	**10822**	**55.60**
NICOBAR DISTRICT			
Car Nicobar island	20487	27482	34.14
Chowra island	4245	2048	-51.76
Teressa island	10154	3089	-69.58
Katchal island	3917	939	-76.03
Nancowry island	2891	1066	-63.13
Great Nicobar	1990	699	-64.87
Total	43684	35323	-19.14
Overall	**52201**	**48023**	**-8.00**

Source: Provisional 18th Livestock census report - 2007, Office of the Senior Veterinary Officer, Nicobar District, Dept. of AH&VS, A&N Islands

Poultry

Category-wise Poultry population in A & N Islands (2003 Census)

Category	Desi	Improved	Total
Cock	117794	12708	130502
Hen	275020	47055	322075
Chicks	280040	124497	404537
Drake	24614	953	25567
Duck	23167	1176	24343
Turkey	313	— —-	313
Duckling	16085	1355	17440
Other birds	6101	— —-	6101
Total	**743134 (79.83%)**	**187744 (20.16%)**	**930878**

District / Tehsil-wise poultry population (2003 census)

District/ Tehsil	Desi	Improved	Total
ANDAMAN DISTRICT			
Diglipur	137419	10319	147738
Mayabunder	119144	4879	124023
Rangat	99573	4748	104321
Port Blair	179814	96005	275819
Ferrargung	132582	59433	192015
Total (Andaman dist.)	**668532**	**175384**	**843916**
NICOBAR DISTRICT			
Car Nicobar	27971	2577	30548
Nancowry	46631	9783	56414
Total (Nicobar Dist.)	**74602**	**12360**	**86962**
Total (A& N Islands)	**743134**	**187744**	**930878**

Feed and fodder

Estimation of the present requirement and availability of green and dry fodder and concentrate was done. It was found that availability of green fodder was only 0.44 per cent while the availability of the dry fodder for the livestock was 48.2 per cent. The availability of concentrate was 3.11 per cent only excluding the concentrate required for poultry production.

	Requirement (t/annum)	Availability (t/annum)	Status	% Availability
Green Fodder	135552	600	Deficit	0.44
Dry Fodder	79722	38425	Deficit	48.2
Concentrate	111139	3461	Deficit	3.11

1.6 DISEASES AND HEALTH STATUS OF LIVESTOCK AND POULTRY

The livestock and poultry of these islands in general are free from most of the dreaded diseases of livestock which are prevalent in mainland India viz. Black Quarter, Rinder Pest, Haemorrhagic Septicaemia, Rabies, contagious Bovine Pleuropneumonia etc. Except for three incidences of Foot and Mouth disease (FMD) outbreak in 1985, 1989 and 2005 and three incidence of Swine fever outbreak in 1967, 1987 and 2000, no other outbreak of infectious or contagious disease has been reported so far in Livestock of this territory. The diseases were introduced long back, probably at the time of settlement when the settlers brought the animals from mainland. Over the years due to entry of livestock, meat, meat products, egg, poultry from mainland the diseases like Chronic Respiratory disease, Infectious Bursal disease, Ranikhet disease in poultry have spread to this islands.

To study the islands wise prevalence of livestock and poultry diseases a systematic survey on livestock and poultry diseases was studied in all the inhabited Islands. Based on the active and passive surveillance Island wise prevalence of disease map was prepared.

Cattle

The climatic condition of the islands, high rainfall and high humidity favours the prevalence of parasitic and gastrointestinal parasitic diseases in cattle. The study revealed that the hump sore (Stephanofilariasis) is one of the most prevalent disease in cattle and buffalo caused by a filarial worm known as "Stephanofilaria assamensis". The disease is endemic to these islands and transmitted through house fly (*Musca domesticans*).Probably this disease has reached these Islands from West Bengal and gradually spread in other islands due to the lack of quarantine facilities. The prevalence of hump sore was 60% in the Islands was brought down to less than 35% by effective treatment and control strategies developed by the Institute.

The climatic conditions of these Islands, being ideally suited for the multiplication of snails which act as the intermediate host for many parasites like Fasciola and

Amphistome. The incidence of Ascariasis, Strongylosis, Taeniasis, Trichuris and Schistosomiasis were also reported in the cattle. The overall prevalence of parasitic disease such as Strongylosis, Fascioliasis and Amphistomiasis has been found to be 23%, 10.5% and 24.5% respectively. From the entire survey results it has been found that the major diseases associated with livestock of these islands are basically parasitic disease.

The sero epidemiology of the cattle sera indicated the prevalence of Infectious bovine rhinotracheitis (IBR) which was highest in Rangat Tehsil (41.84%) but a few clinical cases were observed from these Islands and the sero Prevalence of Brucellosis was also found to be highest in Rangat Tehsil (44.89%). The overall sero prevalence of IBR was found to be 20.58% and of Brucellosis was 12.84%. Car Nicobar Tehsil was observed to be free from Brucellosis and in Nancowry Tehsil only 3.88% sero positivity of Brucellosis was observed. The overall percentage of Leptospirosis from the screened areas was found to be 5.75%.The seroprevalence of *L.grippotyphosa, L.hardzo, L.icteohaemmoragiae, L. Pomona* have been reported from the cattle. The Foot and Mouth Disease (FMD) was also reported mainly after the tsunami devastation in the daily cattle.

The incidence of mastitis was found to be high in crossbred cattle. The study found the prevalence of staphylococcal, streptococcal mastitis in the cattle however; Coliform, Corynebacterium, yeast and fungal mastitis were also fond in cattle. The incidence of bovine ephemeral fever was also observed in the cattle.

The cases of infertility, repeat breeding, anestrous have also been reported mainly from the cross bred cows. The study on the mineral profile of soil, water, fodder and in blood profile suggested the deficiency of micro and macro mineral such as

Table : Tehsil wise sero prevalence of parasitic diseases

District	Tehsil	Humpsore (%)	Strongylosis (%)	Fascioliasis (%)	Amphistomiasis (%)
Andaman	Port Blair	44	20.5	5.50	16.50
	Ferrargunj	46	27.82	16.52	24.60
	Diglipur	20	13.00	8.80	21.50
	Mayabunder	15	23.50	11.50	29.50
	Rangat	25	27.00	7.25	24.00
Nicobar	Car Nicobar	41.5	32.5	10	25
	Nancowry	60	29.16	10.42	27.08
	TOTAL	**35**	**23.00**	**10.50**	**24.50**

Table : Tehsil wise percentage prevalence of bacterial and viral diseases

Tehsil	Brucella (%)		IBR (%)	PPRV (%)	Leptospirosis (%)
	SAT	ELISA			
Diglipur	23.33	3.3	10		
Mayabunder	25.9	0	27.5		2.5
Rangat	48.38	45.16	41.93	54.16	16.13
Port Blair	8.77	-	12.12		8.77
Ferrargung	8.88	10	15.58		5.95
Car Nicobar	0	-	21.43		-
Nancowry	0	3.45	10.34		-
Total	**14.08**	**10.82**	**17.68**	**16.05**	**10.88**

Ca: P imbalance in blood, deficiency of Cu, Zn, Co, etc.

Goat

The goat population of these islands is approximately 79219 (Pre tsunami). However, apart from having a large population of these goat of which local Andaman goat are the major population the production performance in general is very low. The factors such as the feed/fodder, infertility, diseases are considered to be responsible for the low productivity.

The disease pattern in the goat indicated the sero prevalence of *Brucella melitensis* (11.96 %), *Mycoplasma capri* (15.7%) and *Leptospirosis* (16.42%). The seroprevalence of *Leptospirosis* was 20.31% at Diglipur and 13.92% at Port Blair. The seroprevalence of *Mycoplasma Capri* was highest (50.63%) at Port Blair followed by Mayabunder

Table : Tehsil wise percentage prevalence of bacterial diseases

Tehsil	Brucellosis	Mycoplasma	Leptospirosis
Diglipur	19.51	14.63	20.31%
Mayabunder	20	17.5	22.22
Rangat	12.76	6.38	_
Port Blair	1.59	50.91	14.28
Ferrargung	11.11	0	-
Car Nicobar	10.53	-	-
Nancowry	12.96	3.7	-
Total	**11.96**	**15.70**	**16.42**

(17.42%). The other diseases like pox virus, contagious ecthyma (orf), enterotoxaemia and gastrointestinal parasitism was also observed.

Pig

The total pig population is approximately 52201 (pre tsunami) of which only 3200 belong to the cross bred or exotic type.

The pigs are mainly susceptible to swine fever. So far three outbreaks of swine fever have been reported from these islands. The Nicobari pigs which are mainly available in the Nicobar groups of islands are susceptible to this disease. The sero prevalence of swine fever was 41.75%, of which Lapathy in Car-Nicobar showed highest Sero-prevalence of 21.87% followed by Diglipur (18.75%), Nancowry (14.28%) & Tamaloo (Car Nicobar, 3.13%). The incidences of ascariasis, tape worm infestation and nutritional deficiency in the pigs have been reported.

Poultry

The poultry population of these islands is approximately 857114 (pre tsunami). The majority of the population belongs to the desi/indigenous type. With the introduction of the exotic germplasm and the establishment of commercial farm the chance of infection and the disease incidence are also increased in the recent past.

In poultry the incidence of Infectious bursal disease (IBD), Chronic respiratory disease (CRD), infectious bronchitis (IB) were reported mainly from the commercial birds. Ranikhet disease is prevalent in desi birds, but with regular vaccination against this disease, the incidence of outbreak have become very less. The other diseases of poultry viz. Salmonellosis, colibacillosis, coccidiosis, lymphoid leucosis etc, has also been observed in high line chicks and desi birds. With the effective management and treatment of disease problems, the mortality amongst the birds is very less. It was found that sero prevalence of *Salmonella pullorum* was 62.19% and Mycoplasma *gallisepticum* was13.57% in A & N Islands. The serum samples from Nancowry Tehsil showed 79.52% sero positivity for IBD.

Apart from the bacterial and viral diseases the incidence of coccidiosis is very high in the backyard poultry. The Infectious coryza and *infectious laryngotracheitis* (ILT) was also reported from the commercial and desi birds. The incidence of parasitic infestation was also observed high in the backyard rural farming and desi birds. The eye worm infection in the birds was reported high and for the first time the causative agent i.e. *Oxyspora mansoni* has been isolated from the birds

Table : Tehsil wise percentage prevalence of bacterial and viral diseases

Districts	IBD	Salmonella		Mycoplasma	IB
		SAT	ELISA		
Andaman	48.47	51.57	78.94	7.62	
Nicobar	74.01	66.93	84.9	26.77	69.56
Total	58.5	55.4	82.82	13.12	69.56

affected with the eye infection. The nutritional deficiencies due to vitamins, minerals have also been reported from the backyard poultry.

Post tsunami disease scenario

Due to major earthquake and tsunami devastation the loss of livestock was recorded as poultry (19.35%), and cattle (10.3%), goat (37.75%) and pig (83.55%). A mild outbreak of **Foot and Mouth Disease (FMD)** in cattle, goat and pig was reported just after the episode of tsunami. Although the clinical symptoms of FMD were observed from the cattle; mortality in the adult was negligible and in calf was 2-3%. The FMD was confirmed by c-ELISA as type O and as an immediate action vaccination of all the animals were taken up and quarantine of the animals were strictly followed.

Prevalent and non- prevalent diseases

Species	Prevalent disease	Not prevalent/reported
Cattle & Buffalo	Brucellois, Infectious Bovine Rhinotracheitis (IBR), Bovine ephemeral fever, Leptospirosis, Mastitis, Stephanofilariasis (Hump Sore), Fascioliasis, Amphistomiasis, Schistosomiasis, Trichuris, Strongylosis, Coccidisosis, Pox virus, Foot and Mouth disease	Haemorrhagic Septicaemia (HS), Black Quarter (BQ), Contagious Bovine Pleuropneumonia (CBPP),Rinder Pest, Anthrax
Goat	Leptospirosis, Brucellosis, Mycoplasma, Contagious ecthyma, Coccidia, Parasitic infestation, Pox virus	Blue tongue, PPR
Pig	Swine fever	Swine Erysepelas
Poultry	Ranikhet disesase, Infectious bursal disease (IBD), Infectious laryngotracheitis (ILT), Infectious bronchitis (IB), Infectious coryza, Chronic respiratory disease (CRD), Salmoneleosis (Bacilary white diarrhea), Colibacillosis, Coccidiosis, parasitic infestation.	Avian Flu

In poultry eye infection was reported. The clinical signs observed were eye discharge in both the eyes, swollen head, and on later stage complete closure of the eyelids and finally death. The isolation and identification of the organisms revealed *Haemophillus, Staphylococcus* and *E.coli*. Incidence of eye infection was reported in poultry and the causative agent was confirmed as *Haemophillus galinarum* .

The sero prevalence result revealed the presence of **salmonellosis** (55.4%) and **infectious bronchitis** (IB) (69.56%). Bovine sera (18%) were screened for ***Brucella abortus*** of which the sero prevalence result revealed the presence of *Brucella abortus.* Poultry sera samples were screened for **infectious bursal disease** (IBD) of which 38% was found positive by AGPT test.

Infertility problem in dairy Cattle

During the survey in different parts of these Islands cases of infertility in dairy cattle were noticed. A total of 31.62% of the surveyed cattle showed reproductive failure or infertility problems. The infertility in dairy cattle was mainly due to the anestrous (48.6%) followed by repeat breeder (33.38%), brucellosis & infectious bovine rhinotracheitis (6%), insemination failure (2%) and few cases of underdeveloped genitalia respectively.

The case of infertility was found to be restricted to some of the pockets of these Islands like Indira nagar,Guptapara, Manjery village where almost 52.63% of cattle showed the cases of infertility. Further survey of the other parts of the village the other villages like New Bimblitan, and some parts of Calicut villages indicated similar problem. The results of the nutrient profile showed that infertility in this area may be related to low availability of nutrients in the soil and fodder. The Ca:P ratio was also found to be lower which suggest one of the cause of infertility. The level of some of the micronutrient like Co, Cu, Zn were found to be lower. Thus it was concluded that the cause of infertility to some extend may be related to deficiency of some of the micro and macronutrient.

1.7 ETHNO VETERINARY PRACTICES

Ethno Veterinary Medicine (EVM) generally employs natural products of plant origin for prevention and treatment of livestock diseases. The emerging trend in favour of EVM is partly due to the issues related to the antimicrobial drug resistance, inaccessibility to modern healthcare in time and cost considerations. The traditional livestock farming with ethno veterinary practices have been

practiced by the rural livestock owners/farmers since time immemorial. The Andaman and Nicobar group of islands is bestowed with very rich biodiversity of medicinal and indigenous plants with ethno veterinary significance. There are lot of reports available in different parts of the country suggesting the traditional and medicinal uses of the plants and extracts for treatment of various diseases of livestock and for enhancing the production performance in cattle.

The studies on the medicinal plants mainly *Morinda citrifolia, Vitex trifolia, Gliricida sepium, Eupatorium odoratum* have been conducted at this institute. The solvent extracts of these medicinal plants showed broad spectrum antimicrobial activity against bacterial and fungal pathogens of livestock and plant pathogens. The feeding of *Morinda citrifolia* fruit juice to poultry enhanced both cellular and humoral immunity and increased egg production and growth performance. The preliminary study on dairy cow indicated the treatment of mastitis in dairy cows.

1.8 DEMAND, SUPPLY STATUS OF LIVESTOCK AND POULTRY PRODUCTS

Requirement of milk (t/annum)

Food Commodities	Availability	Requirement			
		Present	2011	2021	2031
Milk	9225	26489	27683	34603	43254

Production of meat / fish required (t/annum)

Meat/ Fish	%	Present	2011	2021	2031
Cattle & Buffalo Meat	1	131	137	172	215
Goat Meat	2	263	275	344	429
Pig Meat	3	394	412	515	644
Poultry Meat	4	526	550	687	859
Fresh Water Fish Meat	5	657	687	859	1074
Marine Fish Meat	85	11177	11680	14600	18250
Total	**100**	**13149**	**13741**	**17177**	**21471**

Present requirement & availability of meat of different livestock species (t/annum)

	Requirement	Availability	Status	How Much
Cattle & Buffalo Meat	131	62	Deficit	69
Goat Meat	263	16	Deficit	247
Pig Meat	394	112	Deficit	282
Poultry Meat	526	290	Deficit	236
Fresh Water Fish Meat	657	250	Deficit	407
Marine Fish Meat	11177	26000	Excess	-14823

Requirement & availability of meat of different livestock species (t/annum) in 2011

Species	Present Availability	Requirement		
		2011	2021	2031
Cattle & Buffalo Meat	98	137	172	215
Goat Meat	30	275	344	429
Pig Meat	160	412	515	644
Poultry Meat	360	550	687	859
Fresh Water Fish Meat	400	687	859	1074
Marine Fish Meat	27000	11680	14600	18250

Requirement & availability of green fodder (t/annum)

	Requirement	Availability	Status	How Much
Present	135552	600	Deficit	-134952
2011	135552	204635	Excess	69083
2021	135552	304635	Excess	169083
2031	135552	304635	Excess	169083

- Self sufficiency in milk can be achieved by providing proper nutrition to the livestock & by utilizing improved modern animal husbandry practices and ensuring proper livestock support services at farmers door-step
- Some of the Islands are having surplus milk; on these Islands milk processing unit (simplest is khoya making unit) should be installed or famers may be trained in preparation of traditional dairy products and regular ferry services should be ensured

Requirement & Availability of Dry Fodder (t/annum)

	Requirement	Availability	Status	How Much
Present	79722	38425	Deficit	-41297
2011	79722	85000	Excess	5278
2021	79722	85000	Excess	5278
2031	79722	90000	Excess	10278

Requirement & Availability of Dry Fodder (t/annum)

	Requirement	Availability	Status	How Much
Present	111139	3461	Deficit	-107678
2011	111139	21160	Deficit	-89979
2021	111139	22215	Deficit	-88924
2031	111139	25770	Deficit	-85369

- There is huge potential in marine fisheries
- Goat Production & pig production needs special attention
- Goat will be fed on top feeds and grazing on bushes/trees planted on community lands
- Self sufficiency in pork & poultry meat
- Till sufficient quantity of green fodder is available, the available fodder resources should be utilised judiciously
- Use of chaff cutter and manger should be advocated for dairy farmers
- Dry fodder available should be enriched to enhance its nutritive value
- Alternate feed resource have to be explored which can substitute concentrate feeds

1.9 BREEDING POLICY OF LIVESTOCK

Livestock sector has been among the few fast growing sectors in rural India, extremely livelihood intensive, with nearly three fourth of the rural households depending on it for supplementary income crucial to their livelihood. With a bovine population of 59,564, consisting of 49,369 cattle and 10195 buffaloes (2007 census), Andaman and Nicobar Islands accounts for some 0.02% of the total bovine population of India. Mainly non-descript (ND) animals and very few crossbred animals constitute the cattle population. Buffaloes available in these islands are mostly non-descript in nature. It can be seen from the census figures that the

population of cattle and buffalo has decreased tremendously due to devastating Tsunami in 2004.

General Consideration

1. Cross breeding with exotic breeds is recognized as major strategy to increase milk production in cattle, while upgrading towards Murrah is state of the art in buffalo development.
2. Artificial insemination using deep frozen semen is the tool to accelerate the genetic make-up of the cattle and buffalo population
3. Regional and location specific features, such as climatic conditions, feed and fodder availability, livestock management practices and market potential/facilities for livestock produce, have to be taken into account, while proposing breeding interventions.
4. Breed conservation, though formulated as an aim of its own, is to be seen in the context of a prevailing farming system and of the competitiveness of the indigenous breed. Keeping a particular livestock breed must be feasible and particularly viable for the farmer

1.10 CLIMATE CHANGE AND ITS IMPACT ON LIVESTOCK AND POULTRY AND VICE-VERSA

Livestock rearing and environment issues

Livestock rearing directly influences the ecosystem and *vice–versa*. The increase in earth atmospheric temperature directly affects the productivity of the livestock. However, the rearing of livestock also influences the environment as it is considered to be one of the biggest sector worldwide which are responsible for emission of green house gases in the form of methane, CO_2, from dung, manure, pasture field, bio gas etc. Animal wastes are generated in the form of urine, dung, by product wastes etc. The cow dung and urine is generally used for the compost manure while the animal byproducts wastes are disposed without being recycled. The proper disposal of the animal wastes is very important as it transmit the diseases to animals and humans. The contaminated animal wastes pollute the surrounding, soil, water and thereby grazing of cattle in the surrounding may contract the infectious agents from the contaminated environment. In the recent years much attention has been diverted towards the global warming due to increase in the temperature, environment pollution, desertification, degradation

of the land, lack of pasture land thus contributing towards the effect of global warming and climate change. The cattle rearing and its effect on environment need to be addressed in a systematic way and proper guidelines and strategies need to be formulated with respect to its impact on the climate change. The societal, cultural aspects also require to be taken into consideration for formulating the guidelines as this livestock sector is considered to be the backbone of many of the farmer's world wide.

Green house gas emission

As per the FAO estimate livestock are responsible for 18 per cent of greenhouse gas emissions, a bigger share than that of transport. It accounts for nine percent of carbondioxide emissions, most of it due to expansion of pastures and arable land for feed crops. It generates even bigger shares of emissions of other gases with greater potential to warm the atmosphere as much as 37 per cent of methane, mostly from enteric fermentation by ruminants, and 65 per cent of nitrous oxide, mostly from manure.

The livestock sector is growing faster than any other agricultural sub-sector. It provides livelihoods to about 1.3 billion people and contributes about 40 per cent to global agricultural output. For many poor farmers in developing countries livestock are also a source of renewable energy for draft and an essential source of organic fertilizer for their crops. Over the past few years the demand of meat and its products have also increased tremendously. It is estimated that global meat production is projected to more than double from 229 million tones in 1999/ 2001 to 465 million tones in 2050, while milk output is set to climb from 580 to 1043 million tonnes. To cater the need of the meat and meat products the livestock population needs to be doubled which thereby generate more CO_2 and other gases.

The increase in trend of the CO_2 and other green house effect gases from this sector created concern worldwide among the researcher, policy makers.

Climate change

Climate change poses formidable challenge to the development of livestock sector. The anticipated rise in temperature between 2.3 and 4.8°C together with increased precipitation resulting from climate change is likely to aggravate the heat stress in dairy animals, adversely affecting their productive and reproductive performance,

and hence reducing the total area where high yielding dairy cattle can be economically reared. The predicted negative impact of climate change on agriculture would also adversely affect livestock production by aggravating the feed and fodder shortages. The livestock sector which will be a sufferer of climate change is itself a large source of methane emissions, an important greenhouse gas.

Degradation and Deforestation

Livestock rearing is being practiced both in the form of intensive and extensive management system. In the intensive management system the livestock are being reared under stall fed condition while in the extensive system they are being let loose for grazing in the pasture land. The extensive management system plays a critical role in land degradation, climate change, and water and biodiversity loss. The urine and dung directly pollute the soil and water bodies.

The livestock sector is by far the single largest user of land. Livestock now use 30 per cent of the earth's entire land surface, mostly permanent pasture but also including 33 per cent of the global arable land used to producing feed for livestock. Expansion of grazing land for livestock is a key factor in deforestation.

Apart from the emission of the greenhouse effect gases from the livestock rearing the issues which needs special attention are the

- increasingly scarce water resources
- water pollution from animal wastes
- Antibiotics and hormones residue in the milk, meat and meat products.
- Fertilizers and the pesticides used to spray feed crops.

The following measures need to be followed systematically to cope up the problems/issue of environmental impacts. Economic, social, health and environmental perspectives will be critical to solving some of these problems

- improving animal diets (less emission of methane)
- Soil conservation: Restore damaged land through soil conservation, silvipasture, better management of grazing systems and protection of sensitive areas.
- controlled livestock exclusion from sensitive areas
- setting up biogas plant initiatives to recycle manure

- Livestock farming away from the cities.
- Safe disposal of animal wastes Better management of animal waste in industrial production units, better diets to improve nutrient absorption, improved manure management and better use of processed manure on croplands.
- Sustainable intensification of livestock and feed crop production to reduce carbondioxide emissions from deforestation and pasture degradation, improved animal nutrition and manure management to cut methane and nitrogen emissions.

Island Scenario

The impact of livestock rearing under the island ecosystem requires special attention. The impact of global warming and climate change will have direct effect on the Island ecosystem due to rise in the sea level. Due to melting of the glaciers and the continuous rising in the level of sea the low level Island and the area near seashore will be submerged if the trend continues at the same pace.

The Islands have already witnessed the impact of the natural disaster i.e. the major earthquake and tsunami devastation which hit the island on 26th December 2004. The earthquake and tsunami have changed the Island ecosystems as the land mass in the Northern group of Islands have raised and in the Southern group the Islands have submerged. Due to this the Islands have suffered heavy loss to the agricultural land permanently and loss to the livestock. Just after the tsunami devastation there was a huge shortage of the paddy land, pasture land and grazing land for livestock.

Status of waste produced by livestock in A& N Islands

Species	Population as on 2007	Total waste kg/day	Total waste LT/year
Cattle	49369	888642	32.4
Buffalo	10195	203900	7.4
Goat	66550	166375	6.1
Pig	47061	141183	5.1
Poultry including duck	971335	174840	6.4
Total	**1144510**	**1574940**	**57.4**

Availability of N, P, K composition in the animal waste (MT/year)

Species	N	P	K
Cattle	34	22	28
Buffalo	8.35	5.56	6.95
Goat	13.5	5.82	17.46
Pig	18	16	11
Poultry including duck	33	24.08	15.05
Total	**106.85**	**73.46**	**78.46**

The livestock suffered a huge loss in terms of loss of the cattle, goat, pig and poultry which directly affected the island economy and revenue.

The livestock sector also faced a huge shortage of feed, fodder and paddy straw to feed the livestock.

Due to the scarcity of the feed and fodder and grazing land the load of the forest land has increased. Although the Islands are bestowed with approximately 86% of the forests area; the areas are mostly covered under the islands which are not inhabited by the livestock and human population.

The demand of the meat, milk and other byproducts of livestock and poultry indicated that the productivity of the livestock and poultry in this islands need to be doubled to meet the requirement of the fast growing population and tourism. The increase in productivity will generate more amounts of CO2 and other gases which will have direct impact on the environment.

1.11 WATER FOR LIVESTOCK

It is commonly seen that most of the farmers have very little or no idea about the expenses (per day) involved in raising the animals. It is interesting to note that the farmer is even unaware of the fact that the feeding cost of his animal comprises of more than 70% of the total cost of raising the animals.

Water is an important but often overlooked nutrient for livestock. Water makes up over 98 percent of all molecules in the body and is necessary for regulation of body temperature, growth, reproduction, lactation, digestion, lubrication of joints, eyesight, and as a cleansing agent. Water requirements are influenced by several factors, including rate of gain, pregnancy, lactation, activity, type of diet, feed intake, and environmental temperature. These requirements are met by water consumed from wells, ponds, fountains, etc., as well as moisture found in feedstuffs.

Limiting water intake can depress animal performance more quickly and drastically than any other nutrient deficiency. *Domesticated animals can live about 60 days without food, but only seven days without water.*

The livestock sector has an enormous impact on water use, water quality, and aquatic ecosystem, the water used by the sector exceeds 8% of the global total human use. The major part of water is used for feed production, representing 7% of the total world water use. Sediments and nutrients are considered to be the main water polluting agents. The livestock sector is responsible for an estimated 55 % of erosion and 32 and 33 % respectively of the N and P load into freshwater resources. The livestock sector also makes a major contribution to water pollution by pesticide (37%), antibiotics (50%), and heavy metals (37 %).

Livestock land use and management appear to be the main mechanism through which livestock contribute to the water depletion process. Feed and forage production, manure application on crops, and land occupation by extensive system, are among the main drivers for unsustainable nutrient, pesticide and sediment load in water resources worldwide.

Evidence suggests it is the largest sectoral source of water pollutants, principally animal wastes, antibiotics, hormones, chemicals from tanneries, fertilizers and pesticides used for feed crops, and sediments from eroded pastures.

Quality of the water

Water quality and quantity may affect feed consumption and animal health. Low quality water will normally result in reduced water and feed consumption. Certain salts and gases in solution make water more palatable if not present in excess. Coliform counts below 50 per milliliter of water are safe for all cattle. Other possible contaminants include coccidia, staphylococcus, streptococcus, virus, leptospirosis, etc. Presence of pesticides and toxic chemicals in the water affects the health. Water used for cleaning equipment in the milking barn and parlor must be tested annually.

Requirement of water

Modern dairy farming is one of the most water intensive food industries. A dairy cow require 13,000 litres of water per year to produce two cups of milk each week or 1000 litres of water to grow pasture to feed a cow to produce 1 litre of milk. To produce one litre of Milk it is essential to drink minimum 5 litres of water thus animal giving about 10 litres of milk daily should drink more than 75 litres of water.

Water is also consumed directly by livestock, used in factory, farm and abattoir operations, cleaning of shed, cattle, cleaning of utensils, instrument, irrigation of feed and fodder, cleaning of carcass in the slaughter house and required for meat and animal product processing.

Often the requirement of water in the slaughter house is not considered. However, it is to emphasize that clean and safe water is required to clean the carcass and to process the different cut off parts of the livestock and poultry in the slaughter house. Of total water use for processing, 44-60 % is consumed in the slaughter, evisceration and boning areas. Water usage rates range from 6-15 litre per kg of carcass.

The recycling of the waste water emerging from the cattle shed is also of great concern as this may directly goes to the soil, river, and stream thus contaminating the environment. Therefore, at the exit of the cattle shed the drain water should be properly treated so that the water is free from the infectious causes and doses not contaminate the environment. The drain water may be use for the irrigation of the fodder crops use for feeding of the livestock. As this water contains rich nutrients and thereby plants meet the demand of nutrients from this water.

In poultry processing plant water is used for carcasses cleaning ; hot water scalding of birds prior to defeathering, in water flumes for transporting feathers, head, feet and viscera and for chilling birds. Poultry industry tends to be more water intensive per weight unit than beef processing.

Animal waste

Most of the water uses by the livestock return to the environment in the form of manure and wastewater. Livestock dung contains a considerable amount of nutrients (NPK), drug residue, heavy metals and pathogens. If these get into the water or get accumulate in the soil they can pose serious threat to the environment. In the case of productive dairy cow 129.6 kg of N (79% of the total ingested) and 16.7 kg of P (73%) is excreted every year. N is highest in pig manure (76.2 g N/kg dry wt) followed by poultry broiler (40), dairy cattle (39.6), beef cattle (32.5). P is highest in poultry layers (20.8 g/p/kg dry wt) followed by pig (17.6), beef (9.6), dairy cattle (6.7). Approximately 2 liter of urine is delivered to soil by a cow during grazing which can be applied to an area of 0.4 m^2. This represents an instantaneous application of 400-1200 kg N/ha.

Mitigating the problems

Mitigation option relies mainly on the following points:

1. Reduced water use
2. Reduced depletion process
3. Improved replenishment of the water resources.

Status of water supply in A&N Islands as on 2006 and projection for 2020

	Status as on 2006				Projection for 2020		
No of villages	Population (in lakhs)	Demand in MLD	Water Available (MLd)	Excess (+)/shortfall (-)	Population (in lakhs)	Demand in MLD	Excess (+)/shortfall (-)
507	4.681	39.362	49.623	10.27 (+)	6.331	53.913	-4.562

*MLD= Million Liter per day.

Status of drinking water requirement of livestock of A&N Islands

	Status as on 2007			Projection for 2020		
species	Population	Demand in MLD	Water Available (MLd)	Population	Demand in MLD	shortfall
Cattle	49369	2.47	49.623	57677	2.89	11.58
Buffalo	10195	0.51	(including	14516	0.73	(including
Goat	66550	0.67	human	89909	0.90	human
Pig	47061	1.41	consumption)	77923	2.34	consumption)
Poultry including duck	971335	0.29		1443986	0.43	
Total	**1144510**	**5.35**		**1684011**	**7.29**	

Improve water use efficiency

The water use efficiency can be improved by improving the irrigation efficiency and improving the water productivity per unit area.

Waste management

Waste management can be improved by different stages viz., collection, storage, process, and utilization.

- *Production stage:* Feeding of balanced diets improves production level while simultaneously minimizing environmental impacts associated with excreta.
- *Improve manure collection process*: animal housing has to be designed to reduce losses of manure and nutrients through runoff.
- *Improve manure storage*: storage capacity is of prime importance to prevent losses through overflow especially during the rainy season.
- *Improved manure processing* :
- *Improved utilization of manure* : recycling of reusable water products

Island scenario

Water is considered to be one of the major factor in the livestock sector of this islands. The island receives an average rainfall of over 3000 mm. However, during the dry spell i.e January –April islands faces acute scarcity of water shortage. The agriculture is totally dependent on the rain and due to the scarcity of the water the farmers usually follow mono copping pattern and during the dry spell the scarcity of fodder and green grasses have been observed in the islands.

1.12 SIGNIFICANT ACHIEVEMENTS AND IMPORTANT PACKAGE OF PRACTICES

Nicobari fowl

1. Indigenous Nicobari fowls have been characterized for its immunocompetence status and disease resistance traits.
2. Molecular characterization of Nicobari fowl using RAPD-PCR has been carried out and results revealed breed specific band.
3. Breed descriptor for Nicoabri fowl has been prepared and submitted to the National Bureau of Animal Genetic Resources (NBAGR) for inclusion in the FAO animal genetic resource list.
4. Dual purpose synthetic backyard poultry have been developed utilizing Nicobari and White leghorn (Nishibari) and Black Rock and Nicobari fowl (Nicorock) and evaluated in the institute farm and farmers field. The performance of Nicorock revealed 165 eggs per annum and approx. 1. 0 kg body weight at 16 week of age under backyard condition.

Japanese Quails

1. First time quail was introduced in these Islands and made adaptable under hot and humid climatic condition.

2. Under cage and deep litter management the cage management was found better in respect of higher body weight and egg production with lower mortality rate.

3. Quicken (Nicoabri X Quail) was developed and results revealed higher body weight than normal quails.

4. Feeding of *S. cereviseae* and *Lactobacillus acidophilus* in Japanese quails showed higher body weight and lower mortality rate.

5. Feeding of garlic significantly reduced the cholesterol level in meat and serum of Japanese quails.

6. Blue colour of light in the shed improved the egg production in Japanese quails.

Turkey and Guinea fowl

1. For the first time turkey and guinea fowls have been introduced in this islands and performance was evaluated.
2. Artificial insemination technology has been standardized & implemented in Turkey to improve fertility and hatchability.
3. Overall scoring index showed that innate immunocompetence was higher in turkey than guinea fowl.

Ducks

1. Chara and Chembali indigenous duck breed form kerala were introduced and evaluated and found suitable in the island climatic condition.
2. The improvement of desi ducks were conducted through crossing with Khaki Campbell, Chara and Chemballi of Kerala.
3. Genetic relatedness among different crosses of ducks was studied using RAPD-PCR. Maximum genetic similarity was between Andaman duck and Khaki Campbell ducks.
4. The average AEP of desi duck was 110 eggs with average egg weight of 46.8 gm.

Cattle

1. Genetic up-gradation and evaluation of indigenous cattle of Andaman have been conducted and the results revealed that cross bred with 50 % exotic inheritance with local cattle have proved to be successful and showed that

crossbred can be successfully reared under hot and humid climatic condition of these islands.

2. Successful treatment of non-lactating cows by lactation kit has been done.
3. Lactation yield has been increased about three times among the crossbreds than indigenous cows with better peak yield and higher lactation length.

Goat

1. PCR-RAPD analysis of three breeds (Local Andaman and Terresa goat) of goat of Andaman and Nicobar islands has been carried out.
2. Boer cross with local Andaman goat has been successfully produced with AI technology. The body weight of the Boer cross was 25% to 40% more than local Andaman goat.
3. Phenotypic and molecular characterization of the Teressa and local andaman goat have been done and the Teresa goat is being maintained in the institute farm.

Pig

1. The comparative performance of pigs at institute farm and farmers field revealed avg body weight at first furrowing are 110.5 kg and 105 kg respectively and the respective body weight of piglets were 0.98 kg and 1.0 kg.
2. Large white Yorkshire breed has been introduced and evaluated. The average litter size was 8.5 and 6 for Yorkshire and local pig respectively.

Health management

1. Important livestock and poultry diseases have been catalogued and database for the same has been developed in the form of a disease map.
2. Based on the active and passive surveillance the major diseases reported are IBR, Brucellosis, Leptospirosis, Mycoplasmosis, IB, Salmonella etc.
3. Animal disease forecasting module has been developed through NADRES (National Animal Disease Referal Expert System) for forecasting of the important animal diseases.
4. The important parasitic diseases have been catalogued and the diseases are as humpsore, amphistomiasis, coccidiosis, liver fluke etc. Accordingly the deworming schedule has been prepared and recommended.

5. The major causative organism of mastitis was found to be streptococcus and staphylococcus and the drug of choice was gentamicin for treatment of mastitis.

6. The modified ointment for treatment of hump sore was developed and tried successfully in the affected animal and found to cure in 10 days.

7. The diagnositic test such as ELISA, SAT, AGPT etc. were standardized for screening of important diseases such as salmonellosis and IBD.

8. An inactivated vaccine for IBD developed when given at the dose rate of 2 drops intra nasal or orally at 1 week of age.

9. Immune enhancer effect of medicinal plant *Morinda citrifolia* was studied and found to have immuno modulatory property in poultry.

10. Use of Lactobacillus was found to inhibit the growth of aspergillus in the feed for 46 days.

11. Mineral profile of soil, water, fodder, serum from South Andaman area were studied and correlated with incidence of infertility problem in dairy cattle. Major cause of infertility was found to be anestrous.

Livestock Products technology

1. Livestock and poultry post harvest products preparation were standardised for Quail egg pickle, Chicken meat pickle, Gizzard pickle; Egg based pudding, Chicken Samosas, Chicken sausage, Bone soup, Chicken pattice.

1.13 TECHNOLOGY/PACKAGE OF PRACTICES

- Backyard farming of poultry, goat and piggery
- Artificial insemination technology in goat
- Azolla cultivation technology
- Ultrasonography technique for early pregnancy diagnosis
- Animal health information system
- Infertility management in cattle and goat
- Oestrous synchronization in cattle and goat
- *Morinda citrifolia* feeding in poultry to enhance immunity
- Post harvest processing of poultry & egg : Quail egg and gizzard pickle, chicken samosa, patties etc.

- Development of IBD killed vaccine
- Hump sore ointment.
- Detection and quantification of Aflatoxin

1.14 FACTORS LIMITING PRODUCTIVITY

The major constraints hindering the development of animal husbandry in Andaman & Nicobar Islands are listed below:

1. Lack of stated policy on animal breeding and other strategies on livestock development
2. The effective technology intervention on Artificial Insemination has not been fully put into gear. Except cows, other species of animals have not been covered under A.I programme
3. Absence of quality breeds of animals, Except few all the animals are nondescript types and hot humid climate resulting in poor animal productivity
4. Acute shortage of feed, concentrate and green fodder is the root cause of the poor performance as the genetic potentiality of an animal cannot be exploited fully in the absence of proper nutrition
5. Small land holding size, topography and saline affected land are limiting cultivation of fodder. The entire cultivable land is put under crop and vegetable production for human consumption
6. There is no compound feed manufacturer in the whole of the Island. As a result the utilization of non-conventional feed resources could not be maximized
7. Presence of fragmented, unorganized market for all livestock products, which involves chains of middlemen who reap the actual benefit depriving the real producers of their rightful share
8. Poor perception of the farmers towards livestock production as a viable alternative
9. High rainfall causes high incidence of parasitic disease mostly in ruminants
10. Inadequate surveillance and monitoring of infectious and contagions diseases
11. Infertility and disease problems in dairy animals
12. Mineral imbalance in soil, fodder and animals causing low productivity
13. Lack of transport facilities.

2.1 LIVESTOCK AND POULTRY DEVELOPMENT POLICIES FOR ANDAMAN & NICOBAR ISLANDS

The livestock sector in the islands is of recent origin and is endowed with native and indigenous germplasm of cattle, buffalo, goat, pig and poultry. The farming system and productivity of the livestock is not in pace with the growing demand of the islander and the tourists. The growth of livestock sectors suffers from various bottlenecks viz. poor germplasm, acute shortage of feed and fodder, transportation, climate and topography and lack of suitable policies. Therefore, considering the burgeoning population and the future scenario of tourism sector and demand for organic livestock produce, this is the right time to prepare ourselves and reorient research and development programmes towards sustainable livestock production system under the islands condition.

The policy for livestock and poultry development for the Andaman & Nicobar Islands should be formulated keeping in view the status of livestock and poultry, Island ecosystem, rearing practices, socio-cultural aspects and environmental issues.

The policy for development of animal husbandry sector in the islands is being proposed below:

Characterization and conservation of Indigenous livestock and poultry germplasm

- The livestock and poultry of this islands mainly comprises of the indigenous, non-descript and exotic type. Therefore, data base on the animal genetic resources needs to be strengthened and updated.
- Molecular characterization of indigenous goat, pig and poultry germplasm should be carried out to identify the genetic relatedness and origin of the breed.
- The indigenous breeds of livestock and poultry are essentially the products of long term natural selection and are better adopted to withstand tropical diseases and perform under low and medium input. Many of these breeds may have useful genes for disease resistance, fast growth and prolificacy. Such utility genes and breeds should be identified, conserved and utilized.
- The precious indigenous germplasm such as Nicobari pig, Teresa goat and Nicobari fowl should be included in the animal genetic resources data bank of the country.

- *In-situ* and *ex-situ* conservation of the indigenous livestock and poultry should be taken up by CARI and Animal Husbandry Department.
- Efforts should be made to conserve, domesticate and characterize the Andaman Wild pig and Hawa Bill bird to exploit their commercial importance.

Strategies to augment feed and fodder production

The feed and fodder area needs special attention as this is considered to be the important factor in the growth, production, health of the livestock and poultry.

- The area under fodder cultivation should be enhanced and the per unit productivity of the fodder areas needs to be doubled to alleviate the scarcity of the fodder by intercropping and integrated farming system approach.
- The locally available alternate feed ingredients such as sea weeds, coconut cakes, dried tree leaves, rice bran, dead coral, azolla etc are easily available, which can be used to develop alternate feed to reduce the dependence on mainland supply.
- Efforts should be made to improve the efficiency of utilization of existing feed resources as well as improve the nutritive value substantially by inclusion of probiotics, enzymes, location specific mineral supplementation, enrichment of paddy straw with urea and molasses.
- The Government should encourage establishment of compound feed and feed block manufacturing unit to meet out the local demand.
- Integration of fodder in the existing cropping pattern (intercropping in the coconut and areca nut) should be encouraged for improving fodder production.
- Efforts should be made to increase availability of green fodder and grasses though increasing area under fodder crops, agro forestry etc. Community fodder cultivation should be taken up by utilizing uncultivated, barren and fallow lands under each panchayat.
- Fodder production should form part of forest policies especially in areas covered by Joint Forest Management Committee (JFMC) on the periphery of villages.
- Community fodder bank should be established for utilization during any natural calamity.

Breeding policy

There is a need to evolve a comprehensive breeding policy for livestock and poultry in these Islands.

- A reorientation of livestock breeding policy would be attempted with area specific approach backed up by appropriate programs addressing our concerns for indigenous breeds and draught animal power.
- Genetic improvement of the non-descript animals through crossbreeding with superior germplasm and selective breeding of some indigenous breeds of livestock should be taken up.
- Up-gradation of non-descript cattle with Indian and exotic breeds should be continued.
- Scientific genetic selection programmes should be adopted for selection of indigenous population with good production potential and disease resistance charactsistics.
- Buffalo should be promoted as suitable dairy animals for the islands. Up gradation of the available indigenous buffaloes should be taken up using breeds of Indian origin.
- Establishment and strengthening of seed production centre (kids/calves/ piglets/chicks) at every islands to meet out the demand of the quality livestock.
- Strengthening and expansion of artificial insemination (AI) facilities for cattle, buffalo and goat to cover total breedable population at farmer's doorstep.
- Exploitation of modern tools for enhancing productive and reproductive performances in cattle through reproductive technology should be taken up.
- Genetic up gradation of non descript goat with Indian and exotic breeds should be taken up to improve the productivity (meat production).
- The local pigs should be upgraded using exotic pigs to improve the productivity and livelihood of the rural and tribal population.
- The locally available poultry germplasm should be improved for higher meat and egg productivity.

Strategies for improving the livestock health

The livestock and poultry of the islands are free from most of the dreadly diseases which are prevalent in the mainland India. However, the incidence of parasitic and some common diseases are reported and with an aim to develop the islands into disease Free State the following strategies are proposed:

- Surveillance and monitoring of prevalent and emerging diseases of livestock and poultry should be strengthened.
- Livestock health calendar should be developed for effective health management.
- The available data on disease incidence status in livestock and poultry should be compiled and utilized for development of database and decision support system for better preventive livestock health care and management
- Quarantine facility should be established at major islands to prevent introduction of any emerging diseases of livestock and poultry from inter and intra islands.
- Regular monitoring and surveillance of the zoonotic importance diseases like leptospirosis, tuberculosis, brucellosis etc. should be conducted for the agricultural and livestock farmers/labourers in collaboration with RMRC (ICMR).
- Prophylactic vaccination against major diseases of livestock and poultry should be done at all islands.
- Indigenous medicinal plants and ethno veterinary practices should be explored for better livestock health management.
- Capacity building of livestock farmers,/labourers on good animal husbandry practices should be implemented to ensure quality livestock products for the consumers.

Water for livestock production system

Usually farmers pay less attention to the quality and quantity of the water given to the livestock and poultry. However, the low quality water directly affects the production and health of the livestock. Therefore, especial attention should be focused towards providing good quality water to the livestock.

- Village level community water facilities in the form of tank, well, ponds should be created specifically for livestock and husbandry activities.
- Steps should be initiated for improving water use efficiency as well as water productivity through multiple use in the livestock production system
- Quality of the water should be ensured for livestock feeding, health and production of safe livestock produce like meat, milk and egg.
- Quality water supply should be ensured to maintain proper hygiene at slaughter house.

Post harvest processing and value addition of livestock produce

- Ban on indiscriminate slaughter of elite germpalsm should be implemented
- Community milk parlour system should be established at each village level through cooperative and self help groups for clean & hygienic milk production.
- Bulk milk cooler and cold storage milk van should be established for effective milk collection system.
- Location specific milk processing, packaging and storage plant should be established to minimize the transportation loss.
- Cottage based post harvest processing and value addition to the dairy products should be promoted through co-operatives and self help groups.
- The humane method of slaughter and modern slaughter house for livestock and poultry should be created for the quality meat production and processing.

Waste management

The wastes are generated in the form of dung, urine, water, carcass waste and hatchery waste. The waste needs to be disposed off as it may directly contaminate the environment, soil and surrounding and transmit the infection.

- Capacity building on waste management in terms of eco-friendly livestock production system should be taken up for the livestock farmers.
- Community livestock waste management system like formation of compost pits, vermicompost unit, and liquid manure unit should be created at village level.
- Waste management and recycling methods should be explored for effective management of slaughter house and hatchery waste.
- Suitable remedial/alternate measures should be adopted to reduce enteric methane emission through nutritional strategies and effective recycling of livestock waste

Incentive/insurance for livestock

- The insurance coverage for risks due to natural calamities, diseases, out breaks, extreme market fluctuations etc. should be encouraged particularly for owners below the poverty line.
- Measures which facilitate access to credit especially to small holders should be promoted. Short term credit facility being provided to agriculture sector should be extended to Animal Husbandry sector as well.
- Schemes and subsidies for the purchase and maintenance of livestock should be strengthened.

Livestock production cum extension system

- Andaman & Nicobar Island livestock development agency (ANILDA) should be created for effective implementation and monitoring of livestock development programmes by constituting a body from Administration, Department of Animal husbandry and Vety. Services, ANIIDCO, NGO, CARI.
- Rural livestock knowledge centre (RLKC) should be created at every panchayat level to cater the needs of the local farmers on farming system and management.
- Promotion of small holder livestock production system/farming as a livelihood option through formation of livestock co-operative society and self help group.
- Women farmers should be encouraged and trained to take up animal husbandry sector like goat farming, backyard poultry rearing, and production of milk, meat and egg products. Strengthening of livestock census data and realistic estimate should be made to develop carrying capacity of the islands, and to project demand and supply of livestock products.
- LIVESTOK FARMING SYSTEM MODELS (LFSM) should be developed based on the available natural and man made resources viz. plantation based dairy, piggery and goat production especially for the tribal community of Southern group of islands
- Establishing online/offline computer network to link all the dispensary, vety. Hospitals to the Directorate for effective implementation of breeding and health programme and for close monitoring.
- Special attention should be paid to rehabilitate all the stray cattle and other livestock by establishing goshalla.
- Efforts should be made to rehabilitate the livestock farming system at Campbell Bay to meet out the demand of local and armed forces.

2.2 RECOMMENDATION AND ACTION PLAN

1. **Embryo Transfer Technology (ETT) and other reproductive technology should be adopted in islands for faster genetic up gradation of local cattle and buffalo population to augment dairy production the islands.**

Action plan

The staff of Department of Animal Husbandry & Veterinary Services (DAHVS), A & N Administration and Central Agricultural Research Institute (CARI) should be trained at NDRI, Karnal, NDDB, KLDB, IVRI, TANUVAS, Chennai etc. Facilities for ETT and assisted reproductive technology should be created at CARI and A&N Administration should explore possibility of its funding from RKVY funds. **(DAHVS, CARI).**

2. **Surveillance and monitoring of health of livestock and poultry should be strengthened.**

Action Plan

Joint surveillance scheme for disease screening at all the major islands should be carried out on quarterly basis by Central Agricultural Research Institute (CARI) and Department of Animal Husbandry & Veterinary Services (DAHVS), A & N Administration. **(DAHVS, CARI).**

3. **Andaman & Nicobar Island Livestock Development Agency (ANILDA) should be created for effective implementation and monitoring of livestock development programmes by constituting a body from Administration, Department of Animal husbandry and Vety. Services, ANIIDCO, NGO, CARI.**

Action Plan

Department of Animal Husbandry & Veterinary Services (DAHVS), A & N Administration should submit the proposal for inclusion in the agenda for forthcoming Island Development Authority (IDA) meeting for establishing ANILDA in line with High Value Agriculture Development Agency (HVADA) run by Department of Agriculture. **(DAHVS)**

4. **A working group of Central Agricultural Research Institute (CARI), Department of Animal Husbandry & Veterinary Services (DAHVS), A & N Administration and private feed manufacturers should be formed to formulate a work plan to facilitate economic feed production using local and other feed ingredients.**

Action Plan

CARI and Department of Animal Husbandry & Veterinary Services should explore the possibility for production and processing of feed ingredients/

alternative feed ingredients such as maize, rice bran, coconut oil cake, areca sheath, azolla, dry fish production to produce economic ration for livestock and poultry. **(DAHVS, CARI).**

5. **A working group of CARI, DAHVS and forest departments should be formed to explore the feasibility of growing fodder in forest areas covered by Joint Forest Management Committee (JFMC).**

Action Plan

A working group should be established on fodder development program by utilizing all available grazing/fallow land under each panchayat jurisdiction. The existing scheme needs to be reoriented for better implementation of the program. The CARI should act as a convener in collaboration with DAHVS and JFMC for formulation and implementation the program on fodder development. **(DAHVS, CARI, DoEF).**

6. **A mechanism should be developed to make a realistic estimate of production of livestock and poultry products.**

Action Plan

Department of Animal Husbandry & Veterinary Services should explore the possibility for numbering either by tag or electronic identification system to keep track of population, production status and for better health coverage. The same may be linked to all dispensaries, Vety. Hospitals through computer network to the Directorate for effective implementation and close monitoring. **(DAHVS)**

7. **Goats and pigs have huge potential in these Islands. A systematic effort should be initiated for breed improvement and production technology adoption.**

Action Plan

i) Nicobari pigs should be conserved through establishing nucleus herd by DAHVS involving the tribal population and up gradation program should be taken up separately using exotic breeds like Large White Yorkshire (LWY) and Duroc. **(DAHVS)**

ii) CARI should submit a proposal to the Ministry of Environment and Forest, Govt of India in collaboration with Department of Environment and Forest and DAHVS to conserve and propagate Andaman Wild Pig. **(CARI)**

iii) To augment goat production DAHVS and CARI should jointly formulate proposal for physical positioning of breedable population of male and simultaneous up gradation of local goats through AI Technology by utilizing

the Boer, Malabri, Sirohi or Jamunapari goats. A & N Administration should explore possibility of funding of this from RKVY funds. **(DAHVS, CARI).**

8. **A viable livestock and poultry waste disposal policy should be formulated to avoid any pollution of water resources as well as environment.**

Action Plan

i) DAHVS should submit the proposal for establishing Modern slaughter house for livestock and poultry for the quality meat production and processing at major islands. **(DAHVS)**

ii) DAHVS, NABARD and Department of Environment should implement suitable programs for effective Livestock waste management by creating facilities and capacity building for the farmers and slaughter house personal to prevent environmental contamination. **(DAHVS, NABARD)**

9. **Methods for clean milk production, strengthening the milk collection system and post harvest processing for long term preservation of milk and its products should be developed at major islands.**

Action plan

i) CARI should evaluate different methods available for post harvest processing (pasteurization, method for short term preservation at collection centre, microfilteration) of milk and production of traditional dairy products. **(CARI)**

ii) DAHVS, NABARD and ANIIDCO should submit a proposal for establishing facilities for milk collection and processing by involving self help groups or dairy cooperatives at major milk production islands. **(DAHVS)**

10. **The requirement of armed forces for milk, mutton which is being totally outsourced from mainland is worth Rs. 3 crores. A separate programme should be chalked out involving SHGs and creation of processing infrastructure to meet this requirement. This can bring significant income to farm families as well as fresh suppliers to armed forces.**

Action plan

i) NABARD and DAHVS should submit a proposal for exploring meat and milk production by involving self help groups or cooperatives to meet out the demand of the armed forces at different islands. **(DAHVS,NABARD)**