



Background material for the Danish country report to the SoW-AnGR rapport

**Baggrundsmateriale til den danske rapport
om Husdyrgenetisk ressourcer**



Chapter 1. Introducing the Country

Table 1.1 Importance of livestock to the gross domestic product in agriculture (millions of \$US)

Activity	\$US (m illions)	Data from Year
Livestock production (official statistics)	\$4.433	1999
Other agricultural production (official statistics)	\$2.848	1999
Best estimate of additional value of livestock	\$1.000	1999

Comments:

- Best estimate of additional value includes the value of all perceived contributions of livestock to agricultural services, other than food production, e.g. value of fertilizer from animal production, draught and transportation, forage production, etc., which usually are not costed in standard calculations.
- Livestock includes domestic ruminants, non-ruminants, and birds used for food and agriculture.

Source: Danmarks Statistik – 2000

Table 1.2 Land use and current trends (1000 ha)

Category	Area (1000 ha)	Area (1000 ha)	Current trend
	1990	1999	
Arable land	2788	2647	-
Permanent crops	22	40	++
Permanent pastures	217	358	+
Agricultural area	3062	2878	-
Land area	4240	4240	0
Total Area	4310	4310	

Source: Danmarks Statistik 1990 and 2000.

Comments:

- Arable land: land under temporary crops (double-cropped areas are counted only once), temporary meadows for mowing or pasture, land under market and kitchen gardens and land temporarily fallow (less than five years). The abandoned land resulting from shifting cultivation is not included in this category. Data for "Arable land" are not meant to indicate the amount of land that is potentially cultivable.
- Permanent crops: Includes cultures of spruce - mainly Norman and Nobilis, which occupies arable land.
- Permanent pasture: land used permanently (five years or more) for herbaceous forage crops, either cultivated or growing wild (wild prairie or grazing land).
- Land area: total area excluding area under inland water.
- Total area: the total area of the country, including area under inland water.
- Indicate current trends in relation to the latest available year (-- = strongly decreasing, - = decreasing, 0 = stable, + = increasing, ++ = strongly increasing).



Table 1.3 Land use for livestock and current trends

Category	Area (1000 ha)	Area (1000 ha)	Current trend
	1990	1999	
Cropping for food	28	22	-
Cropping for feed	326	433	+
Cropping for food and feed	1889	1651	-
Natural pasture	65	65	0
Improved pasture	152	152	0
Fallow	3	215	++
Forest	275	486	+
Non-agricultural	324	106	--
Total	3062	3130	

Source: Agricultural Statistics 1991 and 2000, and Danish Forest and Nature Agency 1997

Comments:

- Natural pastures are the ones grown without any external inputs.
- Fallow is a non-cultivated cropping land put on rest.
- Indicate current trends in relation to the latest available year (-- = strongly decreasing, - = decreasing, 0 = stable, + = increasing, ++ = strongly increasing).

Table 1.3.1 Marginal agricultural area

Category	Area (1000 ha)	% of land area
Meadows	104	2,4
Salt meadows (marsh)	44	1
Heath	82	1,9
Dry grassland	26	0,6
Total	256	5,9

Source: Danish Forest and Nature Agency 1997

Table 1.4 Land tenure for livestock production

Category	Area (1000 ha)	%
Private	2734	95
Government and communal	144	5
Total	2878	100

Comments:

- Private includes the private sector and the long term leasing.
- Include all land for which the primary purpose of its use is livestock production.

Source: Danmarks Statistik 2000.

Table 1.5 Farm structure and distribution



Category	Number of farms / households	%	Number of farms / households with livestock	%
Landless	0	0	0	0
> 0 to 2 ha	1300	2	990	3
> 2 to 10 ha	8903	15	7000	20
> 10 to 50 ha	26736	46	16379	47
> 50 to 100 ha	10891	19	5000	14
> 100 to 500 ha	6210	11	1500	4
> 500 ha	500	1	210	1
Unknown	3291	6	3621	10
Total	57831	100	34700	100

Source: Modified from Danmarks Statistik 2000

Table 1.6 Livestock population, number of owners/house-holders and employment by species

Species	Livestock population (1000)	Number of owners / house-holders		
Cattle	1868	23031		
Buffalo				
Sheep	118	9000		
Goats	10	1750		
Camels				
Lamas and Alpaca				
Horses *)	40	7959		
Donkeys				
Pigs	11922	13231		
Chicken	37028	6104		
Turkey	546	60		
Ducks	296	393		
Geese	7	442		
Rabbits				
Mink	2188	2523		
Total	54023	64493		

Source: Agricultural Statics 2000. Numbers on sheep and goats from the national data base on registered livestock, 2003.

*) Includes only horses on agricultural farms, the total number of horses in Denmark is estimated to 150.000 (Source: The horse industry in the European Union, 2001)



Table 1.7 Human population in the country

Year	Total (millions)	Rural or Farming (%)	Urban or Non Farming (%)	Total
1990	5135	44	56	100
1999	5330	48	52	100
Average annual growth rate	+0.4%	+1.2%	-0.3%	

Source: Danmarks Statistik 2000

Comments:

“Urban population” is defined as people living in cities larger than 10.000 inhabitants.

Table 1.8 Major livestock primary production (1000 tonnes/numbers)

Species	Meat (t)		Milk (t)		Eggs (t)		Fiber (t)		Skin (No.)	
	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999
Cattle	219,1	167	4742	4655					888	772
Buffalo										
Sheep	1,6	1,5								
Goats	NI	NI	NI	NI						
Camels										
Lamas and Alpaca										
Horses	1,0	1,3								
Donkeys										
Pigs		1748,2								
Chicken	131,4	204,7			82,4	78,2				
Turkey										
Ducks	NI	NI								
Geese	NI	NI								
Rabbits	NI	NI								
Mink									10000	10500

Source: Agricultural Statistics 2000, and Danish Meat Board

NI: No information available



Table 1.9 Major livestock primary product imports (1000 tonnes/numbers)

Species	Meat (t)		Milk (t)		Eggs (t)		Fiber (t)		Skin (No.)		Animals (No.)	
	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999	1990	1991
Cattle	0	86.8	0	380								
Buffalo												
Sheep												
Goats												
Camels												
Lamas and Alpaca												
Horses												
Donkeys												
Pigs												
Chicken					9	25						
Turkey												
Ducks												
Geese												
Rabbits												

Source: Agricultural Statistics 2000

Table 1.10 Major livestock primary product exports (1000 tonnes/numbers)

Species	Meat (t)		Milk (t)		Eggs (t)		Fiber (t)		Skin (No.)		Animals (No.)	
	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999	1990	1991
Cattle		125		3397								
Buffalo												
Sheep												
Goats												
Camels												
Lamas and Alpaca												
Horses												
Donkeys												
Pigs		1449										
Chicken		126										
Turkey												
Ducks												
Geese												
Rabbits												
Mink												

Source: Agricultural Statistics 2000



Chapter 2. The State of Production Systems

Justification and Use

The purpose of this chapter is to get a clear picture on the distribution of livestock species and their role by major production systems. Changes in major production systems over time for major species are monitored. Production systems are defined according to the level of inputs used.

- **Production System:** all input-output relationships, over time, at a particular location. The relationships will include biological, climatic, economic, social, cultural and political factors, which combine to determine the production of a particular livestock enterprise. Also termed **Production Environment**. Production systems range from areas where there is very little husbandry or human modification of the environment, to very intensive management systems where feed, climate, disease and other factors are controlled or managed by farmers. The level of animal husbandry or intervention varies enormously from region to region and from farm to farm. Thus, a common way to classify production environments is to group them according to the level of human intervention as:
 - **High-input Production System:** a production system where all rate-limiting inputs to animal production can be managed to ensure high levels of animal survival, reproduction and output. Output is constrained primarily by managerial decisions.
 - **Medium-input Production System:** a production system where management of the available resources has the scope to overcome the negative effects of the environment, although it is common for one or more factors to limit output, survival or reproduction in a serious fashion.
 - **Low-input Production System:** a production system where one or more rate-limiting inputs impose continuous or variable severe pressure on livestock, resulting in low survival, reproductive rate or output. Output and production risks are exposed to major influences, which may go beyond human management capacity.



Table 2.3.1 Type of livestock farm by production system for dairy cattle - Herds(%)

Type of operation	Production systems			Total
	Low input	Medium input	High input	
Subsistence				0
Smallholder				0
Small-scale-commercial	2	2	4	8
Large-scale-commercial		18	74	92

Source: Agricultural Statistics 2000

Comments: Small-scale-commercial: less than 15 cows/herd

Table 2.3.2 Type of livestock farm by production system for dairy cattle - Production (%)

Type of operation	Production systems			Total
	Low input	Medium input	High input	
Subsistence				0
Smallholder				0
Small-scale-commercial	1	1	3	5
Large-scale-commercial		10	85	95

Source: Agricultural Statistics 2000

Comments: Small-scale-commercial: Less than 15 cows/herd

Table 2.3.3 Type of livestock farm by production system for beef cattle - Herds (%)

Type of operation	Production systems			Total
	Low input	Medium input	High input	
Subsistence				0
Smallholder				0
Small-scale-commercial	23	39	15	77
Large-scale-commercial	3	12	8	23

Source: Agricultural Statistics 2000

Comments: Small-scale-commercial: Less than 15 cows/herd

Table 2.3.4 Type of livestock farm by production system for beef cattle - Production (%)

Type of operation	Production systems			Total
	Low input	Medium input	High input	
Subsistence				0
Smallholder				0
Small-scale-commercial	10	22	11	43
Large-scale-commercial	5	30	22	57

Source: Agricultural Statistics 2000

Comments: Small-scale-commercial: Less than 15 cows/herd



Table 2.5.1 Type of livestock farm by production system for sheep - Herds (%)

Type of operation ⁾	Production systems			Total
	Low input	Medium input	High input	
Subsistence	20	20	0	40
Smallholder	10	10	2	22
Small-scale-commercial	5	5	5	15
Large-scale-commercial	3	8	12	23

Source: Agricultural Statistics 2000

Comments: ⁾) According to flock size: a) 1-9 ewes, b) 10-24, c) 25-49 d) GE 50

Table 2.5.2 Type of livestock farm by production system for sheep - Production (%)

Type of operation ^{*)}	Production systems			Total
	Low input	Medium input	High input	
Subsistence	2	2	0	4
Smallholder	3	4	1	8
Small-scale-commercial	3	4	6	13
Large-scale-commercial	10	26	39	75

Source: Agricultural Statistics 2000

Comments: ^{*)}) According to flock size: a) 1-9 ewes, b) 10-24, c) 25-49 d) GE 50

Table 2.11.1 Type of livestock farm by production system for pigs - Herds (%)

Type of operation ^{*)}	Production systems			Total
	Low input	Medium input	High input	
Subsistence				0
Smallholder				0
Small-scale-commercial			41	41
Large-scale-commercial			59	59

Source: Agricultural Statistics 2000

Comments: Small-scale-commercial: Less than 50 sows/herd

Table 2.11.2 Type of livestock farm by production system for pigs - Production (%)

Type of operation ^{*)}	Production systems			Total
	Low input	Medium input	High input	
Subsistence				0
Smallholder				0
Small-scale-commercial			4	4
Large-scale-commercial			96	96

Source: Agricultural Statistics 2000

Comments: Small-scale-commercial: Less than 50 sows/herd



Table 2.12.1 Type of livestock farm by production system for Egg layers- Herds (%)

Type of operation *)	Production systems			Total
	Low input	Medium input	High input	
Subsistence	92	0	0	92
Smallholder	1	2	0	3
Small-scale-commercial	0	2	1	3
Large-scale-commercial	0	0	2	2

Source: Agricultural Statistics 2000

Comments: *) According to flock size: 1-99, 100-999, 1000-9999, GE 10000 hens/farm

Table 2.12.2 Type of livestock farm by production system for Egg layers - Production (%)

Type of operation *)	Production systems			Total
	Low input	Medium input	High input	
Subsistence	2	0	0	2
Smallholder	0	1	0	1
Small-scale-commercial	0	10	13	23
Large-scale-commercial	0	14	60	74

Source: Agricultural Statistics 2000

Comments: *) According to flock size: 1-99, 100-999, 1000-9999, GE 10000 hens/farm

Table 2.12.3 Type of livestock farm by production system for Broilers - Herds (%)

Type of operation *)	Production systems			Total
	Low input	Medium input	High input	
Subsistence	25	26	0	51
Smallholder	3	4	0	7
Small-scale-commercial	0	13	20	33
Large-scale-commercial	0	0	9	9

Source: Agricultural Statistics 2000

Comments: *) According to annual production: 1-499, 500-24999, 25000-99999, GE 100000 chickens/farm

Table 2.12.4 Type of livestock farm by production system for Broilers - Production (%)

Type of operation *)	Production systems			Total
	Low input	Medium input	High input	
Subsistence	0	1	0	1
Smallholder	1	2	0	3
Small-scale-commercial	0	22	34	56
Large-scale-commercial	0	0	40	40

Source: Agricultural Statistics 2000

Comments: *) According to annual production: 1-499, 500-24999, 25000-99999, GE 100000 chickens/farm



Table 2.17.1 Type of livestock farm by production system for Mink - Herds (%)

Type of operation	Production systems			Total
	Low input	Medium input	High input	
Subsistence				0
Smallholder				0
Small-scale-commercial			31	31
Large-scale-commercial			69	69

Source: Agricultural Statistics 2000

Comments: Small-scale-commercial: Less than 1000 animals

Table 2.17.2 Type of livestock farm by production system for mink - Production (%)

Type of operation	Production systems			Total
	Low input	Medium input	High input	
Subsistence				0
Smallholder				0
Small-scale-commercial			25	25
Large-scale-commercial			75	75

Source: Agricultural Statistics 2000

Comments: Small-scale-commercial: Less than 1000 animals

Of 2,523 farms mink farms in 2002, only 1,441 were registered as agricultural farms.

Table 2.18.1 Type of livestock farm by production system for turkey – Herds (%)

Type of operation *)	Production systems			Total
	Low input	Medium input	High input	
Subsistence	95			95
Smallholder				0
Small-scale-commercial		4		4
Large-scale-commercial			1	1

Source: Agricultural Statistics 2000

Comments: *) According to annual production: 1-499, 500-24999, 25000-99999, GE 100000 chickens/farm

Table 2.18.2 Type of livestock farm by production system for Turkey - Production(%)

Type of operation *)	Production systems			Total
	Low input	Medium input	High input	
Subsistence	1			1
Smallholder				0
Small-scale-commercial			39	39
Large-scale-commercial			60	60

Comments: *) According to annual production: 1-499, 500-24999, 25000-99999, GE 100000 chickens/farm. The HARBOE-Farm slaughter approx. 1 mill. turkeys/ear, and 60-70% are produced on HARBOE-Farm. The other 30-40% are produced by 15-20 farmers / producers (Pers. Communication with HARBOE –Farm) .



Chapter 3. The State of Genetic Diversity

Justification and Use

The purpose of this chapter is to identify the status of the diversity of breeds within species, in terms of total number of breeds, breeds at risk of being lost, and degrees of their characterization.

Table 3.1 Breed Diversity (Number of Breeds)

Species	Number of breeds									
	Current Total		At risk		Widely used		Others		Lost (last 50 yr)	
	L	E	L	E	L	E	L	E	L	E
Cattle	5	19	4	10	1	4		5	0	0
Buffalo										
Sheep	2	15	2	12	0	0		3	0	0
Goats	1	3	1	3	0	0	0	0	0	0
Camels										
Lamas and Alpaca										
Horses	3	26	3	12		1		13	0	0
Donkeys										
Pigs	2	4	2	0	0	4	0	0	0	0
Chicken a)	2	140	1	NI	NI	NI	NI	NI	0	NI
Turkey	0	8		NI	0	1	NI	7	0	NI
Ducks b)	1	20	1	NI	0	0	0	NI	0	NI
Geese c)	2	11	2	NI	0	0	0	NI	0	NI
Rabbits	1	NI	0	NI	1	0	NI	NI	0	NI

Comments:

A breed is considered as represented in Denmark if at least one of the following criteria is fulfilled:

1. A Danish organisation of breeders exist
2. Number of breeders is greater than 10
3. Number of breeding animals is greater than 20

L = Locally Adapted or Native E = Exotic (Recently Introduced and Continually Imported). There is and an ongoing discussion about this classification;

Breeds at risk are those with total number of breeding females and males less than 1,000 and 20, respectively; or with population size less than 1,200 and decreasing.

NI = No information available

- a) The Danish Poultry Breeders Association distinguish among 7 plumage variants landrace hen (Danske Landhøns). However only the brown variety is considered as native. Within the native brown landrace hen a tailless tyoe (“gumpehøns”) and a creeper type (luttehøns) are recognised). The second breed of chickens registered in table 3.1 as Local, is a locally adapted line of White Leghorn (Hvid Italiener), classified as being at risk.
- b) The Danish Poultry breeders Association distinguish among 3 plumage variants of Danish Landrace Duck. However only the Black white breasted is original.
- c) The native Danish Landrace Goose has two plumage variants – a uniform grey (Grå dansk landgås). Both are considered as original. The second breed of geese, registered as Local in table 3.1, is a locally adapted line of the Roman goose (Hvid Italiensk gås).



Table 3.1.1 Cattle in Denmark - Breeds, breeders and cows

Category	Breed	Breeders	Cows
Old Breeds/lines			
	RDM – 1970	26	117
	Jysk Kvæg	25	55
	SDM-1965	5	17
	Korthorn gl. avlslinie	7	15
	Jersey gl. avlslinie a)	1278	4901
	Sortbroget Jydsk Malkekvæg b)	3	96
	"Ø-kvæg" c)	1	22
Other breeds			
	SDM – Dansk Holstein	3468	398750
	RDM - Rød Dansk Malke race	368	48,600
	DJ - Dansk Jersey	543	67650
	DRH – Dansk Red Holstein	24	5450
	Limousine	2931	8188
	Hereford	2610	6040
	Simmental	2106	4142
	Charolais	1003	3559
	Aberdeen Angus	747	3045
	Scottish Highland Cattle	464	1341
	Bl. d'Âquitaine	328	1002
	Dexter	166	477
	Galloway	137	454
	Piemontese	73	231
	Grauvieh (Austrian)	62	218
	Belgian Blue and White	119	166
	Shorthorn	83	169
	Braunvieh (Swiss)	21	68
	Gelbvieh (German)	16	36
	Salers	14	37
	Skovkvæg d)	1	50

Sources: Kvægdatabasen, 2002, Rapport nr. 92, 2001 fra Landbrugets Rådgivningscenter, IEC rapport maj 2002 fra Forskningsstyrelsen.

Comments:

- a) Jersey with all ancestors in 5 generations being Danish Jersey (100% DJ), the number includes all females.
- b) Sortbroget Jydsk Malkekvæg (SJM) is regarded as a special old (primitive) type of Jysk Kvæg. The number of animals includes all females.
- c) "Ø-Kvæg" is a primitive type of cattle, originating from a single herd from the island Agersø. The number includes all females.
- d) Skovkvæg is a beef syntetic experimental population



Table 3.1.2 Breeds of sheep in Denmark, breeders and breeding females and males

Category	Breed	Breeders	Females	Males
Old Danish breeds	Dansk Landfår	11	104	20
	Marsk	22	343	44
	Ertebølle linien **)	4	52	13
Other Breeds	Oxforddown	64	861	113
	Shropshire	154	2446	275
	Leicester	30	493	59
	Texel	130	2720	281
	Dorset	45	1022	104
	Suffolk	58	889	110
	Gute	3	28	3
	Såne*	24	231	34
	Merino	18	229	48
	Østfrisisk Malkefår	2	47	5
	Gotlandsk Pelsfår	19	217	27
	Rygja	8	47	12
	Islandsk får	4	70	7
	Finuld	14	251	25
	Spel	21	234	35

Source: Landbrugets Rådgivningscenter, Rapport nr. 94, 2001 and personal communications.

*) New breed founded in Denmark

**) Special line of Dansk Landfår

Table 3.1.3 Breeds of goats in Denmark, breeders and breeding females and males (year 2000).

Old Danish breeds	Dansk Landged	22	151	28
	Dansk Landrace Ged *)	13	358	19
Other breeds	Mohair	98	803	169
	Nubisk	28	106	39
	Boer	107	642	179
	Saanen	1	10	3

Sources: Landbrugets Rådgivningscenter, Rapport nr. 94, 2001, and IEC rapport fra Forskningsstyrelsen 2002

*) Animals with pedigree information



Table 3.1.4 Breeds of pigs in Denmark, breeders and breeding females and males (year 2000).

Category	Breed	Breeders	Females	Males
Old breeds	DL-1970	14	66	26
	Sortbroget Landrace	17	46	22
Other breeds	Landrace	*	3500	283
	Yorkshire	*	2636	277
	Duroc	*	2149	1151
	Hampshire	*	958	57

Sources: Danske Slagterier og Genressourceudvalget, 2001

Comments:

The nucleous breeding program for "other breeds" is the breeding program by Danske Slagteriernes avlsprogram "DANAVL". It involves 43 nucleous breeders with 52 breeding units. The number of males are boars available through AI.

Table 3.1.5 Breeds of horses in Denmark, breeders and breeding females and males (year 2000).

Category	Breed	Females	Males
Old Breeds	Den Jydske Hest	242	33
	Frederiksborger	188	29
	Knabstrupper (renavlslinie)	15	5
Other breeds a)	Dansk Varmblod	3464	176
	Oldenborger	589	59
	Trakehner	204	24
	Lipizzaner	16	3
	Knabstrupper (krydsningsavl)	165	31
	Palomino	71	9
	Pinto	193	26
	Fjordhest	701	50
	Shire	18	1
	Belgier, Ardenner	231	32
	Araber OX, DSAH, Shagya	60	12
	Fuldblod	252	35
	Travere	1500	135
	Haflinger	106	11
	Den Islandske Hest	1744	142
	Dartmoor pony	40	8
	Connemara	88	21
	Welsh Cob	221	55
	New Forest pony	191	23
	Shetlands pony	848	147
Gotlands Russ	22	5	
Dansk Sportspony Avl	175	26	
Dansk Miniaturehesteforening	69	13	

Source:

<http://www.lr.dk/hest>, Dansk Travsports Centralforbund, and Foreningen til Den ædle hesteavls fremme (Dansk Fuldblod)



Table 3.2 Number of breeds for which characterization has been carried out (Number of breeds)

Species	At population level				At individual level		
	Baseline survey	Genetic distance	Breeds and crosses evaluation	Valuation	Performance recording	Genetic evaluation	Molecular evaluation
Cattle	26	1	12		14	14	4
Buffalo							
Sheep	17	3	0		6	6	0
Goats	4	0	1		4	0	0
Camels							
Lamas and Alpaca							
Horses	16						
Donkeys							
Pigs	6	3	2		4	4	4
Chicken	1	0	0		0	0	0
Turkey	0	0	0		0	0	0
Ducks	1	0	0		0	0	0
Geese	1	0	0		0	0	0
Rabbits	1	0	0		0	0	0



Chapter 4. The State of Utilization of AnGR (Use and Development)

Justification and Use

The purpose of this chapter is to identify the main use of animal genetic resources available in the country, especially the number of breeds that are really active in contributing to food and agricultural products. In addition, it focuses on the status of development of AnGR, their current breeding strategies, gaps and needs, and the involvement of different stakeholders in developing breeding systems.

Table 4.1 Relative importance of livestock products and services within species (%)

Species	Milk	Meat	Eggs	Fiber	Skin	Risk management	Fertiliser	manure	Draught	Culture	Recreation	Fuel	Feather	Environmental management	Total
Cattle	66	15			3		3			4	4	0		5	100
Buffalo															0
Sheep		80		8	2		0			1	3			6	100
Goats	20	10		40	5	0	0			10	10	0		5	100
Camels															0
Lamas and Alpaca															0
Horses		15		0	0	0	5	5	5	65	0			5	100
Donkeys															0
Pigs		95		0		0	3			1	1				100
Chicken		58	27				2			3	10				100
Turkey		98								1	1				100
Ducks		95								3	2				100
Geese		80								10	10				100
Rabbits		50							50						100
Mink	0	0	0	0	100	0	0	0	0	0	0	0	0	0	100

Comments:

- Think of the food and agricultural outputs as products that have a relative contribution to national production. Therefore, assign relative contributions for the important products listed below, based on a thorough analyses and valuation of data available in the country (sum of each species = 100).



Table 4.2 Relative importance of species within livestock products and services (%)

Species	Milk	Meat	Eggs	Fiber	Skin	Risk management	Fertiliser	manure	Draught	Culture	Recreation	Fuel	Feather	Environmental management†
Cattle	100	14			8		42			40	10			60
Sheep		2		60			1			10	5			18
Goats		1		40			1				2			2
Horses		1					1			20	73			20
Pigs		72					46							
Chicken		7	100				7			30	10			
Turkey		2					2							
Ducks		1					0							
Geese							0							
Rabbits							0							
Mink					92		2							
Total	100	100	100	100	100	0	100	0	100	100	100	0	0	100

Comments:

- Assign relative contribution values for each product as a % of total output of that product, based on a thorough analyses of data available in the country (sum of each column = 100).



Table 4.3 Number of widely used breeds with breeding strategies (No. of breeds)

Species	Total number of breeds	Breeding strategies		
		Purebred selection	Cross-breeding	Both
Cattle	26	16	0	0
Buffalo				
Sheep	17	6	0	0
Goats	4	3	0	0
Camels				
Lamas and Alpaca				
Horses	16	16	2	1
Donkeys				
Pigs	6	4	4	4
Chicken		2	2	2
Turkey				
Ducks				
Geese				
Rabbits				

Table 4.4 Number of breeds with current breeding strategies and tools being used (No. of breeds)

Species	Breeding goals	Breeding strategies		Tools				
		Designed	Designed and implemented	Individual identificatio	Recording	AI	ET	Genetic evaluation
Cattle	16	16	16	24	16	18	10	16
Buffalo								
Sheep	6	6	6	17	6	0	0	6
Goats	4	4	4	4	4	0	3	4
Camels								
Lamas and								
Horses								
Donkeys								
Pigs	4	4	4	4	4	4	0	4
Chicken								
Turkey								
Ducks								
Geese								
Rabbits								
Mink	1	1	1	1	1	0	0	1

Comments: AI = Artificial Insemination; ET = Embryo Transfer.



Table 4.5 State of the art of technologies / methodologies used in breeding strategies

Technology or Methodology	Used for:	
	Research	Breeders
Multi-trait selection index construction	100	100
Optimization tools for breeding plans	100	100
Electronic database related to recording schemes	100	100
Genetic evaluation Software for: phenotypic selection breeding	100	100
Reproductive technologies (AI, ET, etc) mainly applied in dairy cattle	100	50
Microsatellite linkage maps for QTL identification for Marker	100	0
Other technology (specify)	50	0

Comments: Assign a percentage to indicate the extent that the technology or methodology is being used at research institutions or by breeder's associations in the country.

Table 4.6 Role of stakeholders in the implementation of tools for the development of AnGR

Stakeholders	Breeding goals	Individual identification	Recording	Artificial insemination	Genetic evaluation
Federal Government	1	5	1	1	1
State Government					
Local Government					
Breeder's	5	5	5	5	5
Private companies					
Research	4	1	1	1	5
NGO's	3	1	1	1	1

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) based on thorough analyses of data available, to indicate the role of involvement of each stakeholder on the implementation of tools that support the development of AnGR.



Table 4.7 Involvement of stakeholders in activities related to the development of AnGR

Stakeholders	Legislation	Breeding	Infrastructure	Human	Farmer's
Federal Government					
State Government	5	1		3	1
Local Government	1	1		3	1
Breeder's associations	1	5	5	4	5
Private companies	1	1	5	1	1
Research	1	3	1	3	1
NGO's	1	1	1	3	1

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) based on thorough analyses of data available, to indicate the degree of involvement of each stakeholder on activities that support the development of AnGR.

Table 4.8 Stakeholders preference for animal genetic resources

Stakeholders	Locally adapted breeds	Imported within region	Imported exotic breeds
Federal Government			
State Government	5		1
Local Government			1
Breeder's associations	2		5
Private companies			5
Research	3		3
NGO's	5		1

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) based on a thorough analyses of data available, to indicate the degree of preference of the various types of AnGR by stakeholders.

Table 4.9 Priority of needs for utilization of technologies for the development of AnGR

Technology	Needs			
	Knowledge	Training	Financial resources	Breeder's organization
Recording	1	1	1	3
Genetic evaluation	1	1	3	3
AI / ET	3	3	3	3
Molecular techniques	4	5	5	3
Breed organisation techniques	1	1	5	5

Comments:

- AI= Artificial Insemination; ET= Embryo Transfer
- Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the priority of solving specific needs in order to use technologies to support the development of AnGR.



Chapter 5. The State of Conservation of AnGR

Justification and Use

The purpose of this chapter is to identify activities in in-situ and ex-situ conservation programmes, the degree of involvement of stakeholders and future needs for such programmes.

Table 5.1 Current number of breeds in managed conservation programmes

Species	Number of locally adapted breeds at risk			
	Total	Managed <i>in situ</i>	Managed <i>ex situ</i>	Both (<i>in</i> and <i>ex situ</i>)
Cattle	5	5	4	4
Buffalo				
Sheep	2	2	1	1
Goats	1	1	0	0
Camels				
Lamas and Alpaca				
Horses	3	3	0	0
Donkeys				
Pigs	2	2	2	2
Chicken	1	1	0	0
Turkey	1	0	0	0
Ducks	1	1	0	0
Geese	1	1	0	0
Rabbits	0		0	0

Comments:

- *In situ* conservation: includes all measures to maintain live animal breeding populations, including those involved in active breeding strategies in the agro-ecosystem where they either developed or are now normally found, together with husbandry activities that are undertaken to ensure the continued contribution of these resources to sustainable food and agricultural production, now and in the future.
- *Ex situ* conservation: genetic material within living animals but out of the environment in which it developed (*Ex situ in vivo*), or external to the living animal in an artificial environment, usually under cryogenic conditions including, *inter alia*, the cryoconservation of semen, oocytes, embryos, cells or tissues (*Ex situ in vitro*). Note that *ex situ* conservation and *ex situ* preservation are considered here to be synonymous.



Table 5.2 Current number of breeds receiving incentives and for which various tools for management of *ex situ* conservation programmes are used

Species	Incentives			Tools				
	Gov.	NGO	Market	Semen storage	Embryos storage	DNA/Tissue storage	<i>In vivo</i>	Monitoring system
Cattle	4	6	0	3	2	0	6	6
Buffalo								
Sheep	2	2	0	1	0	0	2	2
Goats	0	1	0	0	0	0	1	1
Camels								
Lamas and Alpaca								
Horses	3	3	0	2	0	0	3	3
Donkeys								
Pigs	2	2	0	2	1	0	2	2
Chicken	0	0	0	0	0	0	0	0
Turkey	0	0	0	0	0	0	0	0
Ducks	1	1	0	0	0	0	0	0
Geese	1	1	0	0	0	0	0	0
Rabbits	0	0	0	0	0	0	0	0

Comments:

- In vivo, such as zoological garden, farm park, etc.
- Incentives means any kind of support (human and financial resources, tax waving, higher prices, etc.) that stimulates conservation programmes of AnGR
- Monitoring system refers to the number of schemes in which more than 10% of population size is conserved.

Table 5.3 Current number of breeds receiving incentives and for which tools for *in situ* conservation programmes are used

Species	Incentives				Technical tools			
	Gov.	NGO	Market	Private	Recording	AI	ET	Others
Cattle	3	4			4	4	3	
Buffalo								
Sheep	1	2			2			
Goats	0	1			1			
Camels								
Lamas and Alpaca								
Horses	3	3			3			
Donkeys								
Pigs	2	2			2	2		
Chicken								
Turkey								
Ducks	1	1						
Geese	1	1						
Rabbits								

Comments:

- AI = Artificial Insemination; ET = Embryo Transfer.
- Incentives means any kind of support (human and financial resources, tax waving, higher prices, etc.) that stimulates conservation programmes of AnGR.



Table 5.4 Stakeholders involvement in the management of conservation programmes

Stakeholders	<i>In situ</i> Conservation	<i>Ex situ</i> Conservation
Government	5	5
Breeder's associations	5	1
Private companies	1	1
Research institutions/universities	2	3
NGO's	5	3

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) based on thorough analyses of data available, to indicate the degree of involvement of each stakeholder on conservation programmes.

Table 5.5 Priority of needs for utilization of technologies for *in situ* conservation programmes

Technology	Needs			
	Knowledge	Training	Financial resources	Technology
Recording	1	1	5	1
Genetic evaluation	1	1	5	1
AI / ET	3	4	5	3
Molecular techniques	3	4	5	1
Breeder improvement techniques	1	1	5	1

Comments:

- AI= Artificial Insemination; ET= Embryo Transfer
- Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the priority of solving specific needs in order to use technologies to support conservation programmes.



Chapter 6. The State of Policy Development and Institutional Arrangements for AnGR

Justification and Use

The purpose of this chapter is to identify policies related to the use, development and conservation of animal genetic resources. It summarises needs and identifies the main priorities to be considered in policy development for animal genetic resources management.

Table 6.1. Effects of existing policies and legal instruments on the utilization (use and development) of AnGR

Species	Urban/peri-urban systems		Rural production	
	Industrial systems	Small-holder systems	Industrial systems	Small-holder systems
Cattle			2	2
Buffalo				
Sheep			2	2
Goats			2	2
Camels				
Lamas and Alpaca				
Horses			1	2
Donkeys				
Pigs			2	2
Chicken			2	2
Turkey				
Ducks			2	2
Geese			1	1
Rabbits			1	1

Comments: Assign a score (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the extent that existing policies and legal instruments support the use and development of AnGR.

Note: The economic conditions for animal production are influenced by legislation that regulates production and production conditions. A growing interest for utilisation and conservation of AnGR is observed among Small-holders and part time farmers.



Table 6.2 The focus of current policies on activities related to the utilization (use and development) of AnGR

Species	Activities			
	Use of exotic breeds	Use of locally adapted breeds	Training, research and extension	Organization of breeders/farmers
Cattle	1	3	5	4
Sheep	1	3	5	3
Goats	1	2	3	1
Horses	1	3	3	1
Pigs	1	2	4	5
Chicken	1	4	2	1
Ducks	1	4	2	2
Geese	1	3	2	2
Mink	1	1	1	1

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the extent that current policies support activities related to the utilization of AnGR.

Table 6.3 Prioritising the needs to enable the development of AnGR policies

Needs	Required		
	Immediately	Medium term	Long term
Financial resources	5	3	3
Organizational structures	3	3	3
Research - human resources	3	3	3

Comments: identify the main needs for policy development and specify if it is critical (immediately required) or important in the medium or long term.



Table 6.4 The priority of future needs in policy development for AnGR conservation programmes

Species	Policy development related to:				
	Technology	Infrastructure	Human resources	Financial resources	Organizational structures
Cattle	2	1	3	5	4
Buffalo					
Sheep	2	1	3	5	4
Goats	2	1	3	5	4
Camels					
Lamas and Alpaca					
Horses	2	1	3	5	4
Donkeys					
Pigs	2	1	3	5	4
Chicken	2	1	3	4	5
Turkey	2	1	3	4	5
Ducks	2	1	3	4	5
Geese	2	1	3	4	5
Rabbits	2	1	3	4	5
Mink	2	1	3	5	4

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the priority for the development of policies to support AnGR conservation programmes.

Table 6.5 The priority of future needs in policy development for the utilization (use and development) of AnGR

Species	Policy development related to:				
	Technology	Infrastructure	Human resources	Financial resources	Organizational structures
Cattle	2	1	3	4	5
Buffalo					
Sheep	2	1	3	4	5
Goats	2	1	3	4	5
Camels					
Lamas and Alpaca					
Horses	2	1	3	4	5
Donkeys					
Pigs	2	1	3	4	5
Chicken	2	1	3	4	5
Turkey	2	1	3	4	5
Ducks	2	1	3	4	5
Geese	2	1	3	4	5
Rabbits	2	1	3	4	5
Mink	2	1	3	4	5

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the priority for the development of policies to support the utilization of AnGR.