

Appendix 5: Animal Husbandry with aquaculture and fisheries

Table 1: Energy use for fodder production. Energy use is given as process energy. No inclusion of conversion transmission losses or production and delivery energy.

Product	Country	Source	Comment	Energy, MJ/kg output	Energy carrier
Fodder for pigs	Sweden	Johansson & Drake, 1995, p. 5, Appendix 7	On farm production	0,26	energy carrier not specified
Fodder for pigs	Sweden	Johansson & Drake, 1995, p. 5, Appendix 7	Industrial production	0,32	energy carrier not specified
Fodder for pigs	Sweden	Carlsson-Kanyama, 1998, p. 48	Industrial production	0,40	electricity and steam
Fodder for hen	Sweden	Johansson & Drake, 1995, p. 5, Appendix 7	On farm production	0,24	energy carrier not specified
Fodder for hen	Sweden	Johansson & Drake, 1995, p. 5, Appendix 7	Industrial production	0,32	energy carrier not specified
Fodder for dairy cows	Sweden	Johansson & Drake, 1995, p. 5, Appendix 7	On farm production	0,25	energy carrier not specified
Fodder for dairy cows	Sweden	Johansson & Drake, 1995, p. 5, Appendix 7	Industrial production	0,32	energy carrier not specified
Fodder for dairy cows	Sweden	Cederberg, 1998, p. 24	Industrial production	0,37	0,186 MJ electricity, rest fossil fuel
Fodder for calves	Sweden	Cederberg, 1998, p. 38	Industrial production	0,24	energy carrier not specified
Whey, drying of	-	Cederberg, 1998, p. 38	Industrial production, DM 90%	17,90	natural gas
Whey, drying of	-	Cederberg, 1998, p. 38	Industrial production, DM 60%	6,85	energy carrier not specified

Table 2: Energy use for production of fish meal. Energy use is given as process energy. No inclusion of conversion transmission losses or production and delivery energy.

Product	Country	Source	Comment	Energy used	Unit and energy carrier
Fish meal	Norway	Moller and Hogaas, 1997, p. 17	-	1,09	MJ diesel per kg input

Table 3: Feeding plan for laying hens.

Country	Sweden	
Source	Naturvårdsverket, 1997a, p.127	-
Comment	data for 1997	
		share of ingredient
Type of ingredient	Cereals	0,74
	Proteinfodder	0,16
	Vitamins and minerals	0,1

Table 4: Feeding plan for broilers

Country	Sweden	
Source	Naturvårdsverket, 1997a, p.123	-
Comment	data for 1997	
		share of ingredient
Type of ingredient	Cereals	0,70
	Proteinfodder	0,25
	Vitamins and minerals	0,05

Table 5a: Feeding plan for pigs

Country	Sweden	
Source	Naturvårdsverket, 1997a, p.122	-
Comment	Including fodder for sow, 19 piglets /year	-
		share of ingredient
Type of ingredient	Cereals	0,85
	Proteinfodder	0,15

Table 5b: Feeding plan for pigs

Country	Sweden	
Source	Carlsson-Kanyama, 1998, p. 14	-
Comment	based on data for 1995	-
		share of ingredient
Type of ingredient	Oat	0,06
	Barley	0,39
	Wheat	0,35
	Rape seed meal	0,1
	Soya bean meal	0,08
	Fodder peas	0,02

Table 6: Feeding plan for sheep

Country	Sweden	
Source	Naturvårdsverket, 1997a, p.120	-
Comment	Including fodder for ewe, 1,9 lambs/year. Coarse fodder and pasture in DM	-
		share of ingredient
Type of ingredient	Cereals	0,10
	Proteinfodder	0,03
	Coarse fodder	0,36
	Pasture on arable land	0,10
	Pasture, cutover	0,42

Table 7a: Feeding plan for a bull calf

Country	Sweden	
Source	Naturvårdsverket, 1997a, p.114	-
Comment	Spring born calves, from 70 kg to 265 kg carcassweight, coarse fodder in DM	-
		share of ingredient
Type of ingredient	Cereals	0,47
	Proteinfodder	0,03
	Coarse fodder	0,50

Table 7b: Feeding plan for a bull calf

Country	Sweden	
Source	Naturvårdsverket, 1997a, p.114	-
Comment	Autumn born calves, from 70 kg to 300 kg carcassweight, coarse fodder and pasture in DM	-
		share of ingredient
Type of ingredient	Cereals	0,28
	Proteinfodder	0,02
	Coarse fodder	0,45
	Pasture on arable land	0,10
	Pasture, cutover	0,15

Table 7c: Feeding plan for a steer

Country	Sweden	
Source	SLU, 1996, p. 211, ref. from 1996	-
Comment	feeding a steer to 12-24 months, carcassweight 275 kg, coarse fodder and pasture in DM	-
		share of ingredient
Type of ingredient	Cereals	0,12
	Proteinfodder	0,01
	Coarse fodder	0,30
	Pasture	0,45
	Minerals	0,01
	Milksubstitute	0,00
	Calffodder	0,01
	Haulm	0,10

Table 7d: Feeding plan for a bull calf

Country	Sweden	
Source	SLU, 1996, p. 211, ref. from 1996	
Comment	feeding to 15-16 months, carcassweight 250 kg, coarse fodder in DM	
		share of ingredient
Type of ingredient	Cereals	0,47
	Proteinfodder	0,03
	Coarse fodder	0,46
	Minerals	0,01
	Milksubstitute	0,01
	Calffodder	0,02

Table 7e: Feeding plan for a bull calf

Country	Sweden	
Source	SLU, 1996, p. 211, ref. from 1996	-
Comment	feeding to 16-18 months, carcassweight 275 kg, coarse fodder and pasture in DM	-
		share of ingredient
Type of ingredient and %	Cereals	0,28
	Proteinfodder	0,03
	Coarse fodder	0,41
	Pasture	0,20
	Minerals	0,01
	Milksubstitute	0,01
	Calffodder	0,01
	Haulm	0,06

Table 7f: Feeding plan for a fattening bull

Country	Sweden	
Source	SLU, 1996, p. 212, ref. from 1996	-
Comment	feeding to 11-12 months, carcassweight 220 kg	-
		share of ingredient
Type of ingredient	Cereals	0,66
	Proteinfodder	0,05
	Coarse fodder	0,07
	Betfor	0,06
	Minerals	0,02
	Milksubstitute	0,01
	Calffodder	0,02
	Haulm	0,01

Table 7g: Feeding plan for a stock (breeding) bull, intensive

Country	Switzerland	
Source	FiBL 1998, p. 16	-
Comment	Intensive feeding, from 65 kg to 525 kg live weight (278 kg carcass weight), 383 days, 2'427 kg fodder	-
		share of ingredient
Type of ingredient	Mais silage (DM)	0,45
	Fatstock fodder	0,25
	Grass silage (DM)	0,22
	Calf fodder	0,05
	Dry fodder (DM)	0,03
	Minerals, salt	0,01

Table 7h: Feeding plan for a stock (breeding) bull, half-intensive

Country	Switzerland	
Source	FiBL 1998, p. 16	-
Comment	Half-intensive feeding, from 65 kg to 525 kg live weight, 439 days, 2'530 kg fodder	-
		share of ingredient
Type of ingredient	Fatstock fodder	0,25
	Mais silage (DM)	0,44
	Grass silage (DM)	0,22
	Calf fodder	0,04
	Dry fodder (DM)	0,04
	Minerals, salt	0,01

Table 8a: Feeding plan for a milking cow

Country	Sweden	
Source	Naturvårdsverket, 1997a, p.110	-
Comment	Coarse fodder and pasture in DM, 7 300 kg of milk/year. Ref. from 1995	-
		share of ingredient
Type of ingredient	Cereals	0,26
	Proteinfodder	0,11
	Coarse fodder	0,47
	Pasture	0,16
	Minerals	0,0034

Table 8b: Feeding plan for a milking cow

Country	Sweden	
Source	SLU, 1996, p. 154	-
Comment	Coarse fodder and pasture in DM, 6 000 kg of milk/year. Ref. from 1989	-
		share of ingredient
Type of ingredient	Cereals	0,22
	Proteinfodder	0,07
	Coarse fodder	0,27
	Hey	0,25
	Pasture	0,18
	Minerals	0,01

Table 8c: Feeding plan for a milking cow

Country	Sweden	
Source	SLU, 1996, p. 154	-
Comment	Coarse fodder and pasture in DM, 10 000 kg of milk/year. Ref. from 1989	-
		share of ingredient
Type of ingredient	Cereals	0,28
	Proteinfodder	0,21
	Coarse fodder	0,23
	Hey	0,13
	Pasture	0,14
	Minerals	0,01

Table 8d: Feeding plan for a milking cow

Country	Switzerland	
Source	FiBL 1998, p. 12	-
Comment	All fodder in DM, 4740 kg of milk/year, no silage zone	-
		share of ingredient
Type of ingredient	Pasture	0,50
	Dry fodder	0,36
	Fodder potatoes	0,06
	Sugar beets	0,04
	Complementary fodder	0,0269

Table 8e: Feeding plan for a milking cow

Country	Switzerland	
Source	FIBL 1998, p. 12	-
Comment	All fodder in DM, 4740 kg of milk/year, silage zone, organic production	-
		share of ingredient
Type of ingredient	Grass	0,51
	Dry fodder	0,27
	Maize silage	0,16
	Complementary fodder	0,0621

Table 8f: Feeding plan for a milking cow

Country	Switzerland	
Source	FiBL 1998, p. 12	-
Comment	All fodder in DM, 4740 kg of milk/year, no silage zone, organic production	-
		share of ingredient
Type of ingredient	Grass	0,50
	Dry fodder	0,36
	Potatoes	0,06
	Sugar beets	0,0432
	Complementary fodder	0,03

Table 9a: Feeding plan for a heifer

Country	Sweden	
Source	Naturvårdsverket, 1997a, p.111	-
Comment	Coarse fodder and pasture in DM, from 70 kg to 24 months, 500 kg. Ref. from 1995	-
		share of ingredient
Type of ingredient	Milksubstitute	0,003
	Cereals	0,05
	Proteinfodder	0,02
	Coarse fodder	0,48
	Pasture	0,45

Table 9b: Feeding plan for a heifer

Country	Sweden	
Source	SLU, 1996, p. 151	-
Comment	Coarse fodder and pasture in DM, to 24 months, 470 kg live weight. Ref. from 1989	-
		share of ingredient
Type of ingredient	Milksubstitute	0,01
	Calffodder	0,01
	Cereals	0,17
	Proteinfodder	0,02
	Coarse fodder	0,44
	Pasture	0,34

Table 9c: Feeding plan for a heifer

Country	Sweden	
Source	SLU, 1996, p. 151	-
Comment	Coarse fodder and pasture in DM, to 30 months, 500 kg live weight. Ref. from 1989	-
		share of ingredient
Type of ingredient	Milksubstitute	0,00
	Calffodder	0,01
	Cereals	0,07
	Proteinfodder	0,02
	Coarse fodder	0,61
	Pasture	0,28

Table 9d: Feeding plan for a heifer/ox, extensive

Country	Switzerland	
Source	FiBL 1998, p. 16	-
Comment	Extensive feeding, from 65 kg to 500 kg live weight (260 kg carcass weight), 3225 kg DM fodder, 611 days	-
		share of ingredient
Type of ingredient	calf fodder	0,03
	Mais silage (DM)	0,56
	Grass silage (DM)	0,25
	Pasture (DM)	0,15
	Minerals, salt	0,01

Table 9e: Feeding plan for a heifer/ox, half –intensive

Country	Switzerland	
Source	FiBL 1998, p. 17	-
Comment	Half-intensive feeding, organic, from 65 kg to 525 kg live weight (273 kg carcass weight), 475 days	-
		share of ingredient
Type of ingredient	calf fodder	0,04
	Grass silage (DM)	0,71
	Fatstock fodder (DM)	0,14
	Dry fodder (DM)	0,10
	Minerals, salt	0.01

Table 9f: Feeding plan for a heifer/ox, fattening on pasture

Country	Switzerland	
Source	FiBL 1998, p. 17	-
Comment	Organic feeding, from 65 kg to 550 kg live weight (286 kg carcass weight), 607 days	-
		share of ingredient
Type of ingredient	Pasture (DM)	0,40
	Grass silage (DM)	0,35
	Dry fodder (DM)	0,11
	Full milk	0,10
	Fatstock fodder	0.03
	Minerals, salt	0.01

Table 10: Energy use in shelters for some animals. Energy use is given as process energy. No inclusion of conversion transmission losses or production and delivery energy.

Type of shelter	Country	Source	Comment	Electricity, MJ	Unit
Baconer, stable	Denmark	Weidema, 1995, p. 61	Ref. from 1992/93	126	per baconer
Baconer, stable	Sweden	Edsjö, 1995, p. 12	ref. from 1995	29	per baconer
Dairy cows, milking equipment	Sweden	Cederberg, 1998, p. 41	Data for 1998, energy for milking, cooling	4561	per cow, year
Dairy cows, milking equipment	Sweden	Cederberg, 1998, p. 41	Data for 1998, energy for milking cooling	3960	per cow, year
Dairy cows, milking equipment	Denmark	Cederberg, 1998, p. 41	Data for 1998, energy for milking cooling	2422	per cow, year
Dairy cows, milking equipment	Norway	Moller and Hogaas, 1997, p. 39	Energy for milking cooling	0,18	per kg milk
Egg production	Sweden	Kronägg, Roland Käll, pers. com. 0100	Energy for the whole plant	0,72	per kg egg
Egg production	Switzerland	FiBL 1998, p. 34	Deep litter, without moul, 2000 places	1.4	per kg egg
Egg production	Switzerland	FiBL 1998, p. 34	Deep litter, with moul, 2000 places	1.3	per kg egg
Egg production	Switzerland	FiBL 1998, p. 34	Free range, without moul, 2000 places	1.6	per kg egg
Egg production	Switzerland	FiBL 1998, p. 34	Organic, free range, without moul, 2000 places	1.5	per kg egg
Egg production	Switzerland	FiBL 1998, p. 34	Free range, without moul, 2000 places	0.75	per kg egg

Table 11a: Energy use for slaughtering of baconers. Energy use is given as process energy. No inclusion of conversion transmission losses or production and delivery energy.

Country	Denmark	
Source	Weidema, 1995, p. 130	-
Comment	-	-
Energy use/baconer	MJ electricity	39
	m ³ propane gas	0,02
	kg fuel oil	1,10
	litre gas oil	0,56

Table 11b: Energy use for slaughtering of cattle. Energy use is given as process energy. No inclusion of conversion transmission losses or production and delivery energy.

Country	Norway	
Source	Moller and Hogaas, 1997, p. 21	-
Comment	slaughtering and cutting	-
Energy use/kg carcass	MJ electricity	1,63
	MJ oil	0,67
	MJ gas	0,14
	MJ elektrokjel	0,53

Table 11c: Energy use for slaughtering of cattle. Energy use is given as process energy. No inclusion of conversion transmission losses or production and delivery energy.

Country	-	
Source	Heiss, 1996, p. 50	-
Comment	-	-
Energy used/kg liveweight	MJ electricity	0,10
	MJ, energy carrier not known	0,30

Table 11d: Energy use for slaughtering of poultry. Energy use is given as process energy. No inclusion of conversion transmission losses or production and delivery energy.

Country	-	
Source	Thermie, 1995, p. 5	-
Comment	-	-
Energy used/kg output	MJ, energy carrier not known	1,30

Table 12: Energy use for fishing. Energy use is given as process energy. No inclusion of conversion transmission losses or production and delivery energy.

Type of fishing	Country	Source	Comment	Amount of fish caught (kg) per litre of fuel
Coastal fishing net and longling	Norway	Pimentel, 1996, Table 9.2	Ref. from 1982	13
Longling, continental shelf	-	Pimentel, 1996, Table 9.2	Ref. from 1982	7,0
Factory vessels	USA	Pimentel, 1996, Table 9.2	Ref. from 1982	3,4
All types, sea	Sweden	SCB, 1995a, SCB1995b	Data for 1994. All Swedish sea fisheries.	5,7

Table 13: Resource use in aquaculture

Country	USA, Louisiana	Thailand	Thailand
Source	Pimentel, 1996, Table 9.5	Pimentel, 1996, Table 9.10	Pimentel, 1996, Table 9.10
Comment	Catfish, ref. from 1971, 1974	Sea bass, ref. from 1990	Shrimps, ref. from 1992
Yield, kg/ha	2783	14000	2135
Electricity for pumping, MJ /ha	6001	-	-
Fuel and lubrication, litres/ha	-	1890	-
Fertilisers and other chemicals, kg/ha	3	-	-
Feed, kg/ha	5925	35000	6000