**APPENDIX 2**

List of parameters used in SPIRALL. Ksh is Kenyan Shillings

| SPIRALL PARAMETERS | VALUE |
|---|---|
| Adult Equivalents[1] | 0.52 (<5); 0.85 (6-12); 0.96 (13-17 males); 0.96 (13-17 females); 1 (>17 males); 0.86 (>17 females) |
| Calorie needs for above age-sex classes (kcal/day)[1] | 1720; 1720; 1943; 1943; 2024; 1943 |
| Cattle male:female ratio[2] | 43/57 |
| Camel male:female ratio[2] | 33/67 |
| Sheep male:female ratio[2] | 13/87 |
| Goat male:female ratio[2] | 26/74 |
| Cattle max age; weaning age[2] | 13 years; 9 months |
| Camel max age; weaning age[2] | 25 years; 7 months |
| Sheep max age; weaning age[2] | 5 years; 2 months |
| Goat max age; weaning age[2] | 5 years; 2 months |
| Monthly death rate - Cattle calf[2] | 0.029 |
| Monthly death rate - Camel calf[2] | 0.029 |
| Monthly death rate - Kids[2] | 0.018 |
| Monthly death rate - Lambs[2] | 0.029 |
| Expected weight (kg) at age (months) - Cattle[3] | 250 * (1 – exp (-350 * 0.017 * n /120)) |
| Expected weight (kg) at age (months) - Goat[3] | 34 * (1 – exp (-34 * 0.02 * n /6)) |
| Expected weight (kg) at age (months) - Sheep[3] | 34 * (1 – exp (-34 * 0.02 * n /6)) |
| Expected weight (kg) at age (months) - Camel[3] | 450 * (1 – exp (-350 * 0.00018 * n /1.6)) |
| Relative biomass pool preference**** | (GreenHerb, DeadHerb, GreenShrub, DeadShrub, ShrubBranch, GreenTree, DeadTree, TreeBranch) |
| *Cattle* | 0.8; 0.16; 0.03; 0.01; 0; 0; 0; 0 |
| *Sheep* | 0.45; 0.22; 0.19; 0.09; 0; 0.03; 0.02; 0 |
| *Goat* | 0.23; 0.12; 0.17; 0.08; 0.02; 0.24; 0.12; 0.02 |

| | |
|---|---|
| *Camel* | 0.03; 0.02; 0.45; 0.23; 0.05; 0.14; 0.07; 0.01 |
| Maintenance Energy requirements -Cattle (MJ)[3] | 0.48 * (BW ^ 0.75) |
| Maintenance Energy requirements -Camel (MJ)[4] | 0.314 * (BW ^ 0.75) |
| Maintenance Energy requirements -Sheep (MJ)[5] | 0.25 * (BW ^ 0.75) |
| Maintenance Energy requirements -Goat (MJ)[6] | 0.3 * (BW ^ 0.75) |
| Livestock breeding month | All species reproduce in April and November |
| Fraction reproducing in April and November* | |
| Cattle | 0.5, 0.2 |
| Camel | 0.4, 0.1 |
| Sheep | 0.7, 0.3 |
| Goat | 0.7, 0.3 |
| Cattle milk production months[3] | April – August; Nov - Mar |
| Camel milk production months[3] | January - December |
| Shoat milk production months[3] | April – May ; Nov - Dec |
| Cattle Milk Production (kg /lactating individual /month)[1] | 0;0;0;45;46.5;24.8;24;24;0;0;0;0 |
| Camel Milk Production (kg /lactating individual /month)[7] | 15;15;15;51;51;51;45;45;45;36;36;36 |
| Shoat Milk Production (kg /lactating individual /month)[7] | 0;0;0;5;5;0;0;0;0;0;0;0 |
| Maize harvest month[1] | July |
| Milk calories - Cattle[1] | 789 kcal / kg |
| Milk calories – Camel[8] | 700 kcal / kg |
| Milk calories - Sheep / Goat[1] | 530 kcal / kg |
| Opportunistic Slaughter Probability | 0.05 |
| Meat calories[1] | 1720 kcal / kg |
| Maize calories[1] | 3700 kcal / kg |

| | |
|---|---|
| Cost per kcal maize** | 0.013 Kenyan Shillings |
| Monthly sale price of cattle and camel (Ksh)[3] | 5889; 5818; 6798; 6679; 7721; 6924; 6403; 6254; 6743; 6790; 6939 |
| Monthly sale price of sheep and goat (Ksh)[3] | 1212; 1179; 1198; 1160; 1213; 1217; 1167; 1187; 1149; 1232; 1326; 1383 |
| Max monthly food expenses (Ksh) | AE * 750 |
| Monthly Veterinary expenses (Ksh)[9] | Livestock holdings as TLU * 25 |
| Monthly General Expenses (Ksh) | Number of household members * 100 |
| Herb forage energy - Cattle*** | 7 MJ / kg |
| Herb forage energy - Sheep*** | 7 MJ / kg |
| Browse forage energy- Camel*** | 5 MJ / kg |
| Browse forage energy- Goat*** | 8 MJ / kg |

* Only a small fraction of individuals reproduce during the short-wet season. Reproductive rates are set based on approximate inter-birth intervals for each species.

** Cost of purchasing 1kcal of energy from the store was estimated by assuming the cost of 1 kg maize to be 49 Ksh

*** The maximum monthly weight gain possible for each livestock species on an ad-lib diet was used to estimate the energy content of forage. For example, energy contained within a unit of herb forage is set such that cattle feeding at the maximum possible daily rate can gain 15 kg each month.

**** Relative preference for each biomass pool shown by each livestock species was calculated based on the fraction of these pools reported in their diets (Coppock et al. 1986).

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