1. Purpose of Component

The STOCK component encapsulates the GRAZPLAN animal biology model, as described in:

Freer M, Moore AD & Donnelly JR (1997). GRAZPLAN: decision support systems for Australian grazing enterprises. II. The animal biology model for feed intake, production and reproduction and the GrazFeed DSS. *Agricultural Systems* **54**, 77-126.

Animals represented in a component instance may be of different genotypes. In particular, sheep and cattle may be represented within a single component instance.

The animals represented by a component instance are classified into *groups*. The members of each animal group have the same genotype and age class, but may have a range of ages (for example, an animal group containing mature animals may include four-year-old, five-year-old and six-year-old stock). The members of each animal group also have the same stage of pregnancy and/or lactation; the same number of suckling offspring; and occupy the same paddock. The set of animal groups changes as animals enter and leave the simulation, and as physiological events such as maturation, birth or weaning take place. Animal groups that become sufficiently similar are merged into a single group.

Each animal group has a unique, internally-assigned integer *index*, starting at 1. Because the set of groups present in a component instance is dynamic, the index number associated with a particular group may change over time.

Each animal group is also assigned a *paddock*. The forage and supplementary feed available to a group of animals are determined by the paddock it occupies. Paddocks are referred to by name in the STOCK component. It is the user's responsibility to ensure that paddock names correspond to instances of the PADDOCK component or other sources of necessary driving variables.

Each group also has a user-assigned *tag* and *priority*, which need not be unique. Tag values are generally used to manage distinct groups of animals in a common fashion. For example, all lactating ewes may be assigned the same tag value, which may then be used in management rules that keep them grazing together. Animal groups with different tag values are not merged even if they are otherwise similar. If tag values are assigned sequentially starting at 1, they can be used to generate summary variables. Priority values are used to allocate animals to paddocks in the *draft* event.

2. Initialisation Properties

The initialisation variable set is nearly completely optional. The idea is to allow the user to specify a minimal information set as well as a maximally detailed initialisation.

Property	Type	Units	Required?	Description
param_file	string		No	Name of an XML file containing genotypic parameters. If the null string is specified, a default parameter set that is compiled into STOCK.DLL is used. If a file name is used, the parameters in the file modify (rather than replacing) the default parameter set.
genotypes	record[ ]		Yes	Information about each animal genotype:
: *name*	string			• Name used to refer to the genotype in management events.
: *dam_breed*	string			• Maternal genotype (see notes)
: *sire_breed*	string			• Paternal genotype (see notes)
: *generation*	integer4			• Number of generations of crossing: 0 denotes the pure-bred maternal genotype (in which case *sire_breed* is not used), 1 a first cross, 2 a second cross (75% sire:25% dam), etc.
: *srw*	double	kg		• Breed standard reference weight. The default value depends on *dam_breed* and *sire_breed*.
: *conception*	double[ ]	-		• Expected rates of conception with 1, 2 and 3 young for mature ewes or cows in average body condition, over a mating period lasting 2.5 oestrus cycles. Only the first two elements are meaningful for cattle.
: *death_rate*	double	/yr		• Base rate of mortality in mature animals. Default is 0.0.
: *ref_fleece_wt*	double	kg		• Breed reference fleece weight in sheep. The default value depends on *dam_breed* and *sire_breed*.
: *max_fibre_diam*	double	μm		• Maximum average wool fibre diameter in sheep. The default depends on *dam_breed* and *sire_breed*.
: *fleece_yield*	double	kg/kg		• Clean fleece weight as a proportion of greasy fleece weight in sheep. Default is 0.70.
: *peak_milk*	double	kg		• Potential maximum milk yield per head, in 4% fat-corrected milk equivalents, in cattle. Default is 20.0.
: *wnr_death_rate*	double	/yr		• Base rate of mortality in weaners. Default is 0.0.

⇒ The animal type (sheep or cattle) is implicit in the genotype fields.

⇒ It is permitted to set both *dam_breed* and *sire_breed* to the null string. In this case the *name* field must be a valid breed name.

⇒ The set of valid breed names is set out below.

⇒ The *dam_breed* and *sire_breed* fields may contain the name of a genotype defined in an earlier element of the *genotypes* array; multi-breed crosses may be specified in this way.

Property	Type	Units	Required?	Description
cattle	record[ ]		No	Initial state of each animal group for cattle.
: *genotype*	string			• Genotype of this group of animals. Must match the *name* field of an element of the *genotypes* property.
: *number*	integer4			• Number of animals.
: *sex*	string			• Feasible values are ‘cow’, ‘cows’, ‘heifer’, ‘heifers’, ‘steer’, ‘steers’, ‘bull’, ‘bulls’.
: *age*	double	d		• Age of the animals.
: *weight*	double	kg		• Unfasted live weight of the animals.
: *max_prev_wt*	double	kg		• Highest weight recorded to date.
: *mated_to*	string			• Genotype of the bulls to which pregnant or lactating animals were mated. Must match the *name* field of an element of the *genotypes* property.
: *pregnant*	integer4	d		• Zero denotes not pregnant; 1 or more denotes the time since conception. Only meaningful for cows.
: *lactating*	integer4	d		• Zero denotes not lactating; 1 or more denotes the time since parturition. Only meaningful for cows.
: *no_foetuses*	integer4			• Number of foetuses. Only meaningful for females with *pregnant* > 0.
: *no_suckling*	integer4			• Number of suckling calves. Only meaningful for cows with *lactating* > 0.
: *birth_cs*	double	-		• Condition score at parturition. Only meaningful for cows with *lactating* > 0.
: *calf_wt*	double	kg		• Unfasted live weight of suckling calves. Only meaningful for cows with *lactating* > 0.
: *paddock*	string			• Paddock occupied by the animals.
: *tag*	integer4			• Initial tag value for the animal group.
: *priority*	integer4			• Priority accorded the animals in the *draft* event

Property	Type	Units	Required?	Description
sheep	record[ ]		No	Initial state of each animal group for sheep.
: *genotype*	string			• Genotype of this group of animals. Must match the *name* field of an element of the *genotypes* property.
: *number*	integer4			• Number of animals.
: *sex*	string			• Feasible values are 'ewe', 'ewes', 'wether', 'wethers', 'ram', 'rams', 'crypto', 'cryptos'.
: *age*	double	d		• Age of the animals.
: *weight*	double	kg		• Unfasted live weight of the animals.
: *max_prev_wt*	double	kg		• Highest weight recorded to date.
: *fleece_wt*	double	kg		• Greasy fleece weight of the animals.
: *fibre_diam*	double	μm		• Average wool fibre diameter of the animals.
: *mated_to*	string			• Genotype of the rams to which pregnant or lactating animals were mated. Must match the *name* field of an element of the *genotypes* property.
: *pregnant*	integer4	d		• Zero denotes not pregnant; 1 or more denotes the time since conception. Only meaningful for ewes.
: *lactating*	integer4	d		• Zero denotes not lactating; 1 or more denotes the time since parturition. Only meaningful for ewes.
: *no_young*	integer4			• Number of foetuses or suckling lambs. Only meaningful for ewes.
: *birth_cs*	double	-		• Condition score at parturition. Only meaningful for ewes with *lactating* > 0.
: *lamb_wt*	double	kg		• Unfasted live weight of suckling lambs. Only meaningful for ewes with *lactating* > 0.
: *lamb_fleece_wt*	double	kg		• Greasy fleece weight of suckling lambs. Only meaningful for ewes with *lactating* > 0.
: *paddock*	string			• Paddock occupied by the animals.
: *tag*	integer4			• Initial tag value for the animal group.
: *priority*	integer4			• Priority accorded the animals in the *draft* event.
paddock_list	record[ ]		No	Manually-specified structure of paddocks and forages.
: *name*	string			• Name of this paddock (to be used in *move* events).
: *area*	double	ha		• Area of this paddock.
: *slope*	double	deg		• Average slope in this paddock.
: *forages*	string[ ]			• Fully-qualified names of modules that act as forages in this paddock.
: *excretion*	string			• Fully-qualified name of a module that will receive excreta inputs in this paddock via the *add_excreta* event. If the array has zero members, the component will query the simulation to locate the paddocks, forages and excreta-receiving modules.
rand_seed	integer4			Seed for the random number generator (used when computing numbers of animals dying and conceiving from the equations for mortality & conception rates).

If no parameter file is specified, then permitted values for the *dam_breed* and *sire_breed* fields in the *genotypes* property are:

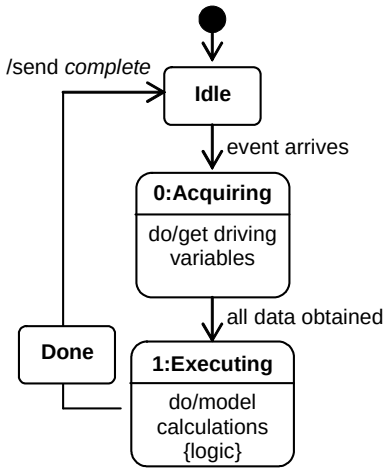
Sheep breeds	Sheep breeds	Cattle breeds	Cattle breeds
'black face x white face'	'polwarth'	'angus'	'friesian'
'border leicester'	'polypay'	'ayrshire'	'friesian x british'
'border leicester x merino'	'romney'	'beef shorthorn'	'guernsey'
'columbia'	'ryeland'	'brahman'	'hereford'
'corriedale'	'southdown'	'brahman x british'	'holstein'
'delaine-merino'	'suffolk'	'brown swiss'	'holstein x british'
'dorset x merino'	'targhee'	'charolais'	'jersey'
'dorset'	'texel'	'charolais x british'	'limousin'
'finnsheep'	'US corriedale'	'charolais x friesian'	'sahiwal'
'hampshire'	'US romney'	'charolais x holstein'	'simmental'
'large merino'	'US southdown'	'chianina'	'south devon'
'medium merino'	'US suffolk'	'dairy shorthorn'	
'small merino'			

3. Subscribed events – sequenced

3.1. do_stock

Default sequencing: 8000

Computes development, intake, growth and reproduction of all animals.



4. Subscribed events – other

4.1. add_animals

Causes a set of related age cohorts of animals to enter the simulation. Each age cohort may contain animals that are pregnant and/or lactating, in which case distributions of numbers of foetuses and/or suckling offspring are computed automatically. This event is primarily intended to simplify the initialisation of flocks and herds in simulations.

Parameter	Type	Units	Description
genotype	string		Genotype of the animals to enter the simulation. Must match the *name* field of a member of the *genotypes* property.
number	integer4		Total number of animals to enter the simulation. The animals will be distributed across the age cohorts, taking the genotype-specific death rate into account.
sex	string		Sex of the animals. Feasible values are as for *sheep*:*sex* or *cattle*:*sex*, as appropriate.
birth_day	integer4		Day of year (1-365) on which all animals are assumed to have been born.
min_years	integer4		Age in years of the youngest age cohort (their exact age will depend on the current day of year and the value of *birth_day*).
max_years	integer4		Age in years of the oldest age cohort.
mean_weight	double	kg	Average unfasted live weight of the animals across all age cohorts. Animals in each age cohort will be given different weights, based on their normal weight for age, such that the overall average weight is that specified by this parameter. This parameter may also be set to zero, in which case a default set of live weights will be computed, taking *cond_score* into account if it is nonzero.
cond_score	double	-	Average condition score of the animals (assumed to be the same for all age cohorts). If a value of zero is given, the default condition score for the weight and age will be used.
mean_fleece_wt	double	kg	Average greasy fleece weight of the animals across all age cohorts. Different values will be computed for each age cohort, such that the weighted average fleece weight equals the specified value. This parameter may be set to zero, in which case a default set of fleece weights will be computed based on the current day of year and the *shear_day* parameter. Only meaningful in sheep.
shear_day			Day of year on which the animals were last shorn. Only meaningful in sheep.
mated_to	string		Genotype of the rams or bulls with which the animals were mated prior to entry. Only meaningful if *pregnant* or *lactating* is non-zero. Must match the *name* field of a member of the *genotypes* property.
pregnant	integer4	d	Zero denotes no animals are pregnant; 1 or more denotes the time since conception of those animals that are pregnant. Only meaningful for females.
foetuses	double	-	Average number of foetuses per animal (including barren animals) across all age classes. Different pregnancy rates will be computed for each age cohort, such that the weighted average number of foetuses per animal equals the specified value. Only meaningful for females.
lactating	integer4	d	Zero denotes no animals are lactating; 1 or more denotes the time since parturition in those animals that are lactating. Only meaningful for females.

Parameter	Type	Units	Description
offspring	double	-	Average number of suckling offspring per animal (including dry animals) across all age classes. Different numbers of offspring will be computed for each age cohort, such that the weighted average number of offspring per animal equals the specified value. Only meaningful for females.
young_wt	double	kg	Average unfasted live weight of any suckling lambs or calves.
young_cond_score	double	kg	Average body condition score of any suckling lambs or calves.
young_fleece_wt	double	kg	Average greasy fleece weight of any suckling lambs.

4.2. buy

Buys animals (i.e. they enter the simulation). The purchased animals will form a new animal group that is placed at the end of the list of animal groups.

Parameter	Type	Units	Description
genotype	string		Genotype of the animals to be bought. Must match the *name* field of a member of the *genotypes* property.
number	integer4		Number of animals to be bought
sex	string		Sex of the animals. Feasible values are as for *sheep*:*sex* or *cattle*:*sex*, as appropriate.
age	double	months	Average age of the animals
weight	double	kg	Average unfasted live weight of the animals. If a value of zero is given, a default value will be calculated, making use of the *cond_score* parameter if it is non-zero.
fleece_wt	double	kg	Average greasy fleece weight of the animals. Only meaningful in sheep.
cond_score	double	-	Average condition score of the animals. If a value of zero is given, the default condition score for the weight and age will be used.
mated_to	string		Genotype of the rams or bulls with which the animals were mated prior to entry. Only meaningful if *pregnant* or *lactating* is non-zero. Must match the *name* field of a member of the *genotypes* property.
pregnant	integer4	d	Zero denotes not pregnant; 1 or more denotes the time since conception. Only meaningful for females.
lactating	integer4	d	Zero denotes not lactating; 1 or more denotes the time since parturition in lactating animals. Only meaningful for females.
no_young	integer4		Number of foetuses and/or suckling offspring.
young_wt	double	kg	Average unfasted live weight of any suckling lambs or calves.
young_fleece_wt	double	kg	Average greasy fleece weight of any suckling lambs.

4.3. castrate

Converts ram lambs to wether lambs, or bull calves to steers. If the animal group(s) denoted by *group* has no suckling young, has no effect.

If the number of male lambs or calves in a nominated group is greater than the number to be castrated, the animal group will be split; the sub-group with castrated offspring will remain at the original index and the sub-group with offspring that were not castrated will be added at the end of the set of animal groups.

Parameter	Type	Units	Description
group	integer4		Index number of the animal group, the lambs or calves of which are to be castrated. A value of zero denotes that each animal group should be processed in turn until the nominated number of offspring has been castrated.
number	integer4		Number of male lambs or calves to be castrated.

4.4. draft

Assigns animals to paddocks. The process is as follows:
(a) Animal groups with a positive priority score are removed from their current paddock; groups with a zero or negative priority score remain in their current paddock.
(b) The set of unoccupied non-excluded paddocks is identified and then ranked according the quality of the pasture (the best paddock is that which would give highest DM intake).
(c) The unallocated animal groups are ranked by their priority (lowest values first).
(d) Unallocated animal groups are then assigned to paddocks in rank order (e.g. those with the lowest positive score are placed in the best unoccupied paddock). Animal groups with the same priority score are placed in the same paddock.

Parameter	Type	Units	Description
closed	string[]		Names of paddocks to be excluded from consideration as possible destinations.

4.5. dryoff

Ends lactation in cows that have already had their calves weaned. The event has no effect on other animals.

If the number of cows in a nominated group is greater than the number to be dried off, the animal group will be split; the sub-group that is no longer lactating will remain at the original index and the sub-group that continues lactating will be added at the end of the set of animal groups.

Parameter	Type	Units	Description
group	integer4		Index number of the animal group for which lactation is to end. A value of zero denotes that each animal group should be processed in turn until the nominated number of cows has been dried off.
number	integer4		Number of cows for which lactation is to end.

4.6. join

Commences mating of a particular group of animals. If the animals are not empty females, or if they are too young, has no effect.

Parameter	Type	Units	Description
group	integer4		Index number of the animal group for which mating is to commence. A value of zero denotes that all empty females of

Parameter	Type	Units	Description
			sufficient age should be mated.
mate_to	string		Genotype of the rams or bulls with which the animals are mated. Must match the *name* field of a member of the *genotypes* property.
mate_days	integer4	d	Length of the mating period.

4.7. move

Changes the paddock to which an animal group is assigned.

Parameter	Type	Units	Description
group	integer4		Index number of the animal group to be moved.
paddock	string		Name of the paddock to which the animal group is to be moved.

4.8. prioritise

Sets the "priority" of an animal group for later use in a *draft* event. It is usual practice to use positive values for priorities.

Parameter	Type	Units	Description
group	integer4		Index number of the animal group for which priority is to be set.
value	integer4		New priority value for the group..

4.9 sell

Removes animals from the simulation. `sell` without parameters will remove all sheep in the stock sub-model.

Parameter	Type	Units	Description
group	integer4		Index number of the animal group from which animals are to be removed. A value of zero denotes that each animal group should be processed in turn until the nominated number of animals has been removed.
number	integer4		Number of animals to remove.

4.10. shear

Shears sheep. The event has no effect on cattle.

Parameter	Type	Units	Description
group	integer4		Index number of the animal group to be shorn. A value of zero denotes that all animal groups should be processed.
sub_group	string		Denotes whether the main group of animals, suckling lambs, or both should be shorn. Feasible values are the null string (main group), ‘adults’ (main group), ‘lambs’ (suckling lambs), ‘both’ (both).

4.11. sort

Rearranges the list of animal groups in ascending order of tag value. This event has no parameters.

4.12. split

Creates two or more animal groups from the nominated group. One of these groups is placed at the end of the animal group list. The new groups remain in the same paddock and keep the same tag value as the original animal group.

The division may only persist until the beginning of the next *do_stock* step, when sufficiently similar groups of animals are merged. Splitting an animal group is therefore usually carried out as a preliminary to some other management event.

Parameter	Type	Units	Description
group	integer4		Index number of the animal group to be split.
type	string		Feasible values are: 'age' All animals older than *value* days are moved to a new group. 'weight' All animals with live weight less than *value* kg are moved to a new group. 'young' Only animals with suckling offspring are affected. Mothers with different sexes of young are divided, with the group with all male offspring remaining in place. For mothers with twins, three groups are created; a group with two male offspring, a group with two female offspring, and a group with one of each. 'number' *value* animals remain in place and the remainder form a new group
value	double		Threshold age or weight, or the number to be split, depending on the value of *type*. Ignored if *type* is 'young'.

4.13. tag

Changes the "tag value" associated with an animal group. This value is used to sort animals; it can also be used to group animals for user-defined purposes (e.g. to identify animals that are to be managed as a single mob even though they differ physiologically) and to keep otherwise similar animal groups distinct from one another.

Parameter	Type	Units	Description
group	integer4		Index number of the animal group to be assigned a tag value.
value	integer4		Tag value to be assigned.

4.14. wean

Weans some or all of the lambs or calves from an animal group. The newly weaned animals are added to the end of the list of animal groups, with males and females in separate groups.

Parameter	Type	Units	Description
group	integer4		Index number of the animal group from which animals are to be removed. A value of zero denotes that each animal group should be processed in turn until the nominated number of lambs or calves has been weaned.
sex	string		Feasible values are: 'all' Female and male lambs or calves are to be weaned. 'females' Only female lambs or calves are to be weaned. 'males' Only male lambs or calves are to be weaned.
number	integer4		Number of lambs or calves to be weaned.

5. Published events

5.1. remove_herbage

Indicates the removal of herbage and seeds. This event is directed to each component instance that provides the Stock instance with a value for the *plant2stock* driving property.

Parameter	Type	Units	Description
herbage	double[ ]	kg/ha	Mass of shoots removed in each of 5 digestibility classes.
seed	double[ ]	kg/ha	Mass of unripe and ripe seeds removed.

5.2. add_excreta

Indicates the excretion of faeces and urine into a paddock. Different instances of this event are directed to each component subscribing to it, with parameters depending upon the name of the paddock component to which the subscribing component belongs.

Parameter	Type	Units	Description
faeces_om	record		Organic matter in excreted faeces:
: *weight*	double	kg/ha	• Mass (as DM) of faeces to be added.
: *n*	double	kg/ha	• Mass of organic nitrogen in faeces.
: *p*	double	kg/ha	• Mass of organic phosphorus in faeces.
: *s*	double	kg/ha	• Mass of organic sulphur in faeces.
: *ash_alk*	double	mol/ha	• Ash alkalinity in faeces.
faeces_inorg	record		Inorganic nutrients in excreted faeces:
: *n*	double	kg/ha	• Mass of inorganic nitrogen in faeces.
: *p*	double	kg/ha	• Mass of inorganic phosphorus in faeces.
: *s*	double	kg/ha	• Mass of inorganic sulphur in faeces.
urine	record		Excreted urine:
: *volume*	double	m^3/ha	• Volume of excreted urine.
: *urea*	double	kg/ha	• Urea-N in excreted urine.
: *pox*	double	kg/ha	• Phosphate-P in excreted urine.
: *so4*	double	kg/ha	• Sulphate-S in excreted urine.
: *ash_alk*	double	mol/ha	• Ash alkalinity in excreted urine.
urine_area	double	m^2/m^2	Proportion of total soil area onto which urine is deposited.

5.3 addfaeces

Only published when a suitable subscribing component is found.

Parameter	Type	Units	Description
AddFaeces	record		Organic matter in excreted faeces:
: Defaecations	double	-	•
: VolumePerDefaecation	double	m^3	
: AreaPerDefaecation	double	m^2	
: Eccentricity	double	-	
: OMWeight	double	kg/ha	
: OMN		kg/ha	
: OMP		kg/ha	
: OMS		kg/ha	
: OMAshAlk		kg/ha	
: NO3N		kg/ha	
: NH4N		kg/ha	
: POXP		kg/ha	
: SO4S		kg/ha	

5.4 addurine

Only published when a suitable subscribing component is found.

Parameter	Type	Units	Description
AddUrine	record		Organic matter in excreted faeces:
: Urinations	double	-	•
: VolumePerUrination	double	m^3	
: AreaPerUrination	double	m^2	
: Eccentricity	double	-	
: Urea	double	kg/ha	
: POX		kg/ha	
: SO4		kg/ha	
: AshAlk		mol/ha	

6. Driving properties

Property	Type	Units	Event:State	Number	Description
area	double	ha	Initialisation	0+	Area of each paddock.
latitude	double	deg	Initialisation	1	Latitude (south is negative).
slope	double	deg	Initialisation	0+	Slope of each paddock.
daylength	double	hr	*do_stock*:0	1	Day length including civil twilight.
plant2stock	record		*do_stock*:0	0+	Description of the pasture for use by the ruminant model.
: *herbage*	record[ ]				
: *dm*	double	kg/ha			
: *dmd*	double	-			
: *cp_conc*	double	kg/kg			
: *p_conc*	double	kg/kg			
: *s_conc*	double	kg/kg			
: *prot_dg*	double	kg/kg			
: *ash_alk*	double	mol/kg			
: *height_ratio*	double	-			
: *propn_green*	double	-			
: *legume*	double	-			
: *select_factor*	double	-			
: *seed*	record[ ]				
: *dm*	double	kg/ha			
: *dmd*	double	-			
: *cp_conc*	double	kg/kg			
: *p_conc*	double	kg/kg			
: *s_conc*	double	kg/kg			
: *prot_dg*	double	kg/kg			
: *ash_alk*	double	mol/kg			
: *height_ratio*	double	-			
: *seed_class*	integer4[ ]				

Property	Type	Units	Event:State	Number	Description
supp2stock	record[ ]		*do_stock*:0	0-1	Amount and attributes of supplementary feed present in each paddock.
: *paddock*	string				• Name of the paddock.
: *amount*	double	kg			• Amount of supplement (fresh weight basis) in the paddock.
: *roughage*	Boolean				• TRUE i.f.f. the feed is a roughage.
: *dm_content*	double	kg/kg			• Dry matter content of the feed.
: *dmd*	double	-			• Dry matter digestibility of the feed (not including any portion that passes the gut undamaged).
: *me_content*	double	MJ/kg			• Metabolizable energy content of the feed.
: *cp_conc*	double	kg/kg			• Crude protein content of the feed.
: *prot_dg*	double	kg/kg			• Protein degradability of the feed.
: *p_conc*	double	kg/kg			• Phosphorus content of the feed.
: *s_conc*	double	kg/kg			• Sulphur content of the feed.
: *ee_conc*	double	kg/kg			• Ether-extractable content of the feed.
: *adip2cp*	double	kg/kg			• Proportion of crude protein that is insoluble in acid detergent.
: *ash_alk*	double	mol/kg			• Ash alkalinity of the feed.
: *max_passage*	double	kg/kg			• Maximum proportion of the feed that will pass undamaged through the gut of ruminants.
time	record		*do_stock*:0	1	Current time step.
: *startDay*	integer4	d			
: *startSec*	integer4	s			
: *startSecPart*	double	s			
: *endDay*	integer4	d			
: *endSec*	integer4	s			
: *endSecPart*	double	s			
waterlog	double	-	*do_stock*:0	0+	Waterlogging index for each paddock.
weather	record		*do_stock*:0	0-1 (see below)	Weather record.
: *maxt*	double	^{o}C			
: *mint*	double	^{o}C			
: *rain*	double	mm			
: *snow*	double	mm			
: *radn*	double	MJ/m^2			
: *vpd*	double	kPa			
: *wind*	double	m/s			

If the following properties are not found, then alternative properties are subscribed to instead:

Property	Alternative	Type	Units	Event:State	Number	Description
weather	*maxt*	double	ºC	*do_stock*:0	1	Maximum air temperature.
weather	*mint*	double	ºC	*do_stock*:0	1	Minimum air temperature.
weather	*rain*	double	mm	*do_stock*:0	1	Precipitation in all forms other than snow.
weather	*wind*	double	m/s	*do_stock*:0	1	Average wind speed

7. Owned properties

All initialisation properties are readable. In addition, the following owned properties are available:

(a) Standard properties

Property	Type	Units	Description
name	string		Fully-qualified name of the component.
type	string		Value is "Stock".
version	string		Value is "1.1".
author	string		Value is "CSIRO Plant Industry".
active	Boolean		Denotes whether or not the component is active.
state	string		SDML description of the current state.

(b) Component-specific properties

Each entry in the following table describes between one and six variables: the named variable and five variants obtained by appending the texts: "*_yng*", "*_all*", "*_tag*", "*_yng_all*" and "*_yng_tag*".

- The variable obtained by appending "*_yng*" is an array of the same type as the base variable. The array has one element for each animal group. Each element of the array denotes the value of the nominated quantity for unweaned lambs or calves of the corresponding animal group. If the animal group has no unweaned lambs or calves, the value is zero. For example, *weight_yng*[4] gives the weight of unweaned lambs or calves in the fourth animal group (if any).
- The variable obtained by appending "*_all*" is a scalar that denotes an average or total of the quantity (as appropriate) over all animals in the component. Unweaned lambs or calves are excluded. For example, there is a *weight_all* variable of double type, which denotes the average weight of all animals, and *number_yng_all* gives the total number of unweaned lambs or calves.
- The variable obtained by appending "*_tag*" is an array of the same type as the base variable. The size of this array is given by the highest tag value assigned to an animal group. Each element of the array denotes an average or total of the quantity (as appropriate) over all animals that have the corresponding tag value. Animals with tag values less than or equal to zero and all unweaned lambs or calves are excluded. For example, *weight_tag*[2] denotes the average weight of all animals with a tag value of 2.

Note that the animal model will automatically merge and split groups of animals, so that the index position of a particular group of animals in the array variables will not necessarily remain constant.

Property	Type	Units	Description	_all	_tag	_yng
age	double[ ]	d	Age of animals.	x	x	x
age_months	double[ ]	-	Age of animals, in months.	x	x	x
base_wt	double[ ]	kg	Fleece-free, conceptus-free weight.	x	x	x
birth_cs	double[ ]	-	Condition score at last parturition; zero if *lactating*=0	x	x	
c_fleece_wt	double[ ]	kg	Current clean fleece weight.	x	x	x
cfleece_growth	double[ ]	kg/d	Growth rate of clean fleece.	x	x	x

Property	Type	Units	Description	_all	_tag	_yng
cond_score	double[ ]	-	Condition score of animals (1-5 scale).	x	x	x
cp_intake	double[ ]	kg/d	Crude protein intake per head.	x	x	x
dse	double[ ]	-	Dry sheep equivalents", based on potential intake.	x	x	x
faeces	record[ ]		Faecal dry matter and nutrients per head.	x	x	x
: weight	double	kg/d				
: n	double	kg/d				
: p	double	kg/d				
: s	double	kg/d				
: ash_alk	double	mol/d				
faeces_inorg	record[ ]		Inorganic nutrients excreted in faeces, per head.	x	x	x
: n	double	kg/d				
: p	double	kg/d				
: s	double	kg/d				
fibre_diam	double[ ]	μm	Current average wool fibre diameter.	x	x	x
fibre_growth_diam	double[ ]	μm	Fibre diameter of the current day's wool growth.	x	x	x
fleece_wt	double[ ]	kg	Current greasy fleece weight.	x	x	x
intake	record[ ]		Total intake per head of dry matter and nutrients by each animal group.	x	x	x
: *weight*	double	kg/d				
: *n*	double	kg/d				
: *p*	double	kg/d				
: *s*	double	kg/d				
: *ash_alk*	double	mol/d				
intake_modifier	double[ ]	-	Externally-imposed scaling factor for potential intake. This property is resettable.			x
lactating	double[ ]	d	If the animals are lactating, the number of days since birth of the lamb or calf; zero otherwise.	x	x	
max_prev_wt	double[ ]	kg	Maximum previous basal weight (fleece-free, conceptus-free) attained by each animal group.	x	x	x
me_intake	double[ ]	MJ/d	Intake per head of metabolizable energy.	x	x	x
methane	double[ ]	kg/d	Output of methane (per head) by each animal group.	x	x	x
milk_me	double[ ]	MJ/d	Metabolizable energy produced in milk (per head) by each animal group	x	x	
milk_wt	double[ ]	kg/d	Weight of milk produced per head, on a 4% fat-corrected basis.	x	x	
no_female	integer4[ ]		Number of female animals in each animal group.	x	x	x
no_foetuses	double[ ]		Number of foetuses per head in each animal group.	x	x	
no_groups	integer4		Number of animal groups.			
no_male	integer4[ ]		Number of male animals in each animal group.	x	x	x
no_suckling	double[ ]		Number of unweaned lambs or calves per head in each animal group.	x	x	

Property	Type	Units	Description	_all	_tag	_yng
number	integer4[ ]		Number of animals in each animal group.	x	x	x
paddock	string[ ]		Paddock occupied by each animal group.			
paddock_rank	string[ ]		List of all paddocks identified by the component, in decreasing order of herbage relative intake (computed for the first group of animals in the list)			
past_intake	record[ ]		Intake per head of pasture dry matter and nutrients by each animal group.	x	x	x
: *weight*	double	kg/d				
: *n*	double	kg/d				
: *p*	double	kg/d				
: *s*	double	kg/d				
: *ash_alk*	double	mol/d				
pregnant	double[ ]	d	If the animals are pregnant, the number of days since conception; zero otherwise.	x	x	
priority	integer4[ ]		Priority score assigned to each animal group; used in drafting.			
rdp_factor	double[ ]	-	Effect of rumen-degradable protein availability on rate of intake (1 = no limitation to due lack of RDP)	x	x	x
rdp_intake	double[ ]	kg/d	Intake per head of rumen-degradable protein	x	x	x
rdp_reqd	double[ ]	kg/d	Requirement per head of rumen-degradable protein	x	x	x
retained_n	double[ ]	kg/d	Nitrogen retained within the animals, on a per-head basis.	x	x	x
retained_p	double[ ]	kg/d	Phosphorus retained within the animals, on a per-head basis.	x	x	x
retained_s	double[ ]	kg/d	Sulphur retained within the animals, on a per-head basis.	x	x	x
sex	string[ ]		See the *sex* field of the *sheep* and *cattle* initialisation variables. Returns “heifer” for cows under two years of age.			
supp_eaten	record[ ]		Consumption of supplementary feed by animals.			
: *paddock*	string		• Name of a paddock			
: *eaten*	double	kg	• Amount of supplementary feed eaten by animals in this paddock.			
supp_intake	record[ ]		Intake per head of supplement dry matter and nutrients by each animal group.	x	x	x
: *weight*	double	kg/d				
: *n*	double	kg/d				
: *p*	double	kg/d				
: *s*	double	kg/d				
: *ash_alk*	double	mol/d				
tag_no	integer4[ ]		Tag value assigned to each animal group.			
trampling	double	kg/ha	Mass of grazers per unit area. The value returned depends on the requesting component.			
urine_n	double[ ]	kg/d	Urinary nitrogen output per head.	x	x	x
urine_p	double[ ]	kg/d	Urinary phosphorus output per head.	x	x	x
urine_s	double[ ]	kg/d	Urinary sulphur output per head.	x	x	x
weight	double[ ]	kg	Average live weight of each animal group.	x	x	x
wt_change	double[ ]	kg/d	Rate of change of base weight of each animal group.	x	x	x

Configuration Details

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Revision History

Version	Date	Changes
0.1	12 Dec 1997	First draft
0.2	17 Dec 1997	Second draft
0.3	4 Aug 1998	Third draft
0.4	10 Dec 2003	Revised to match pre-release version of component. **_tag* properties added
0.5	15 Dec 2003	*supp_eaten* added
1.6	30 May 2005	Changes to representation of genotypes described
1.7	9 March 2006	Minor cleanup
1.8	14 March 2006	*rdp_factor* variable added
1.9	15 November 2006	*paddock_list* variable added
1.10	19 December 2006	Minor corrections. Revised description of *draft* event, and added *prioritise*
1.11	8 August 2007	*rand_seed* and *paddock_rank* properties added
1.12	13 November 2007	*add_animals* event added. Default values implemented for the *weight* parameter in the *buy* event. *methane* output added.
1.13	24 April 2012	*Addfaeces*, *addurine* published events added

Document Distribution Policy

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