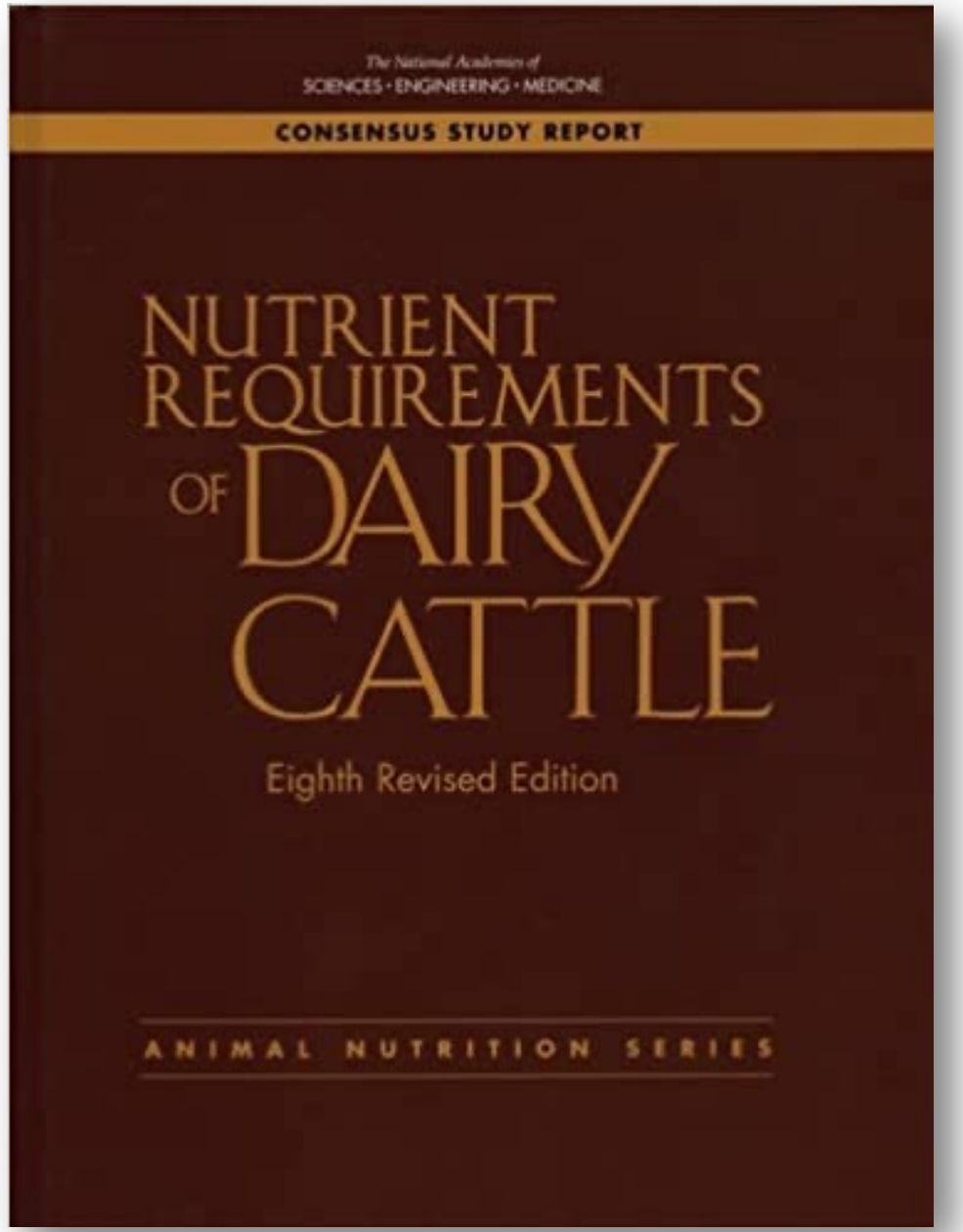
The National Academies of
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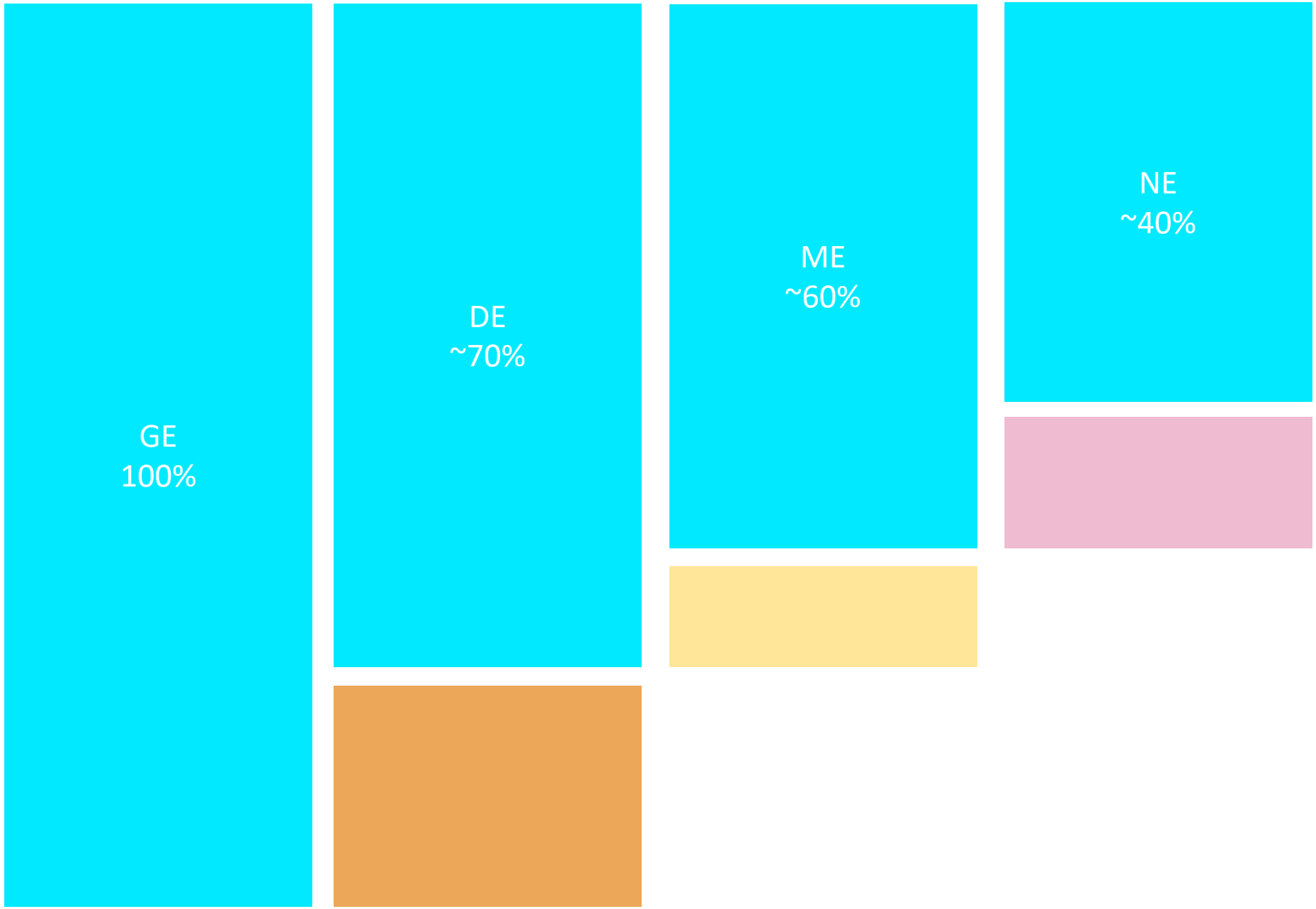
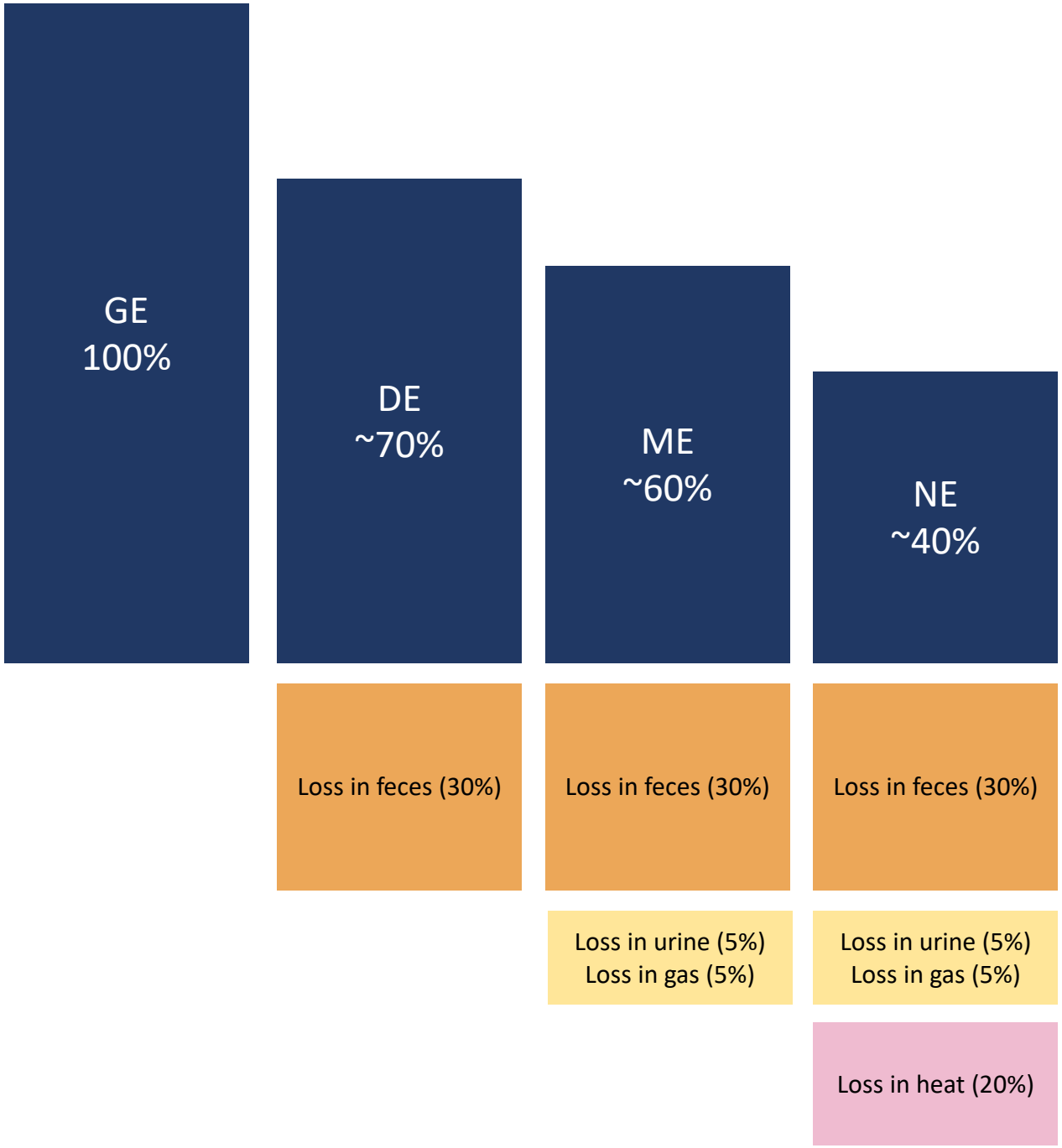
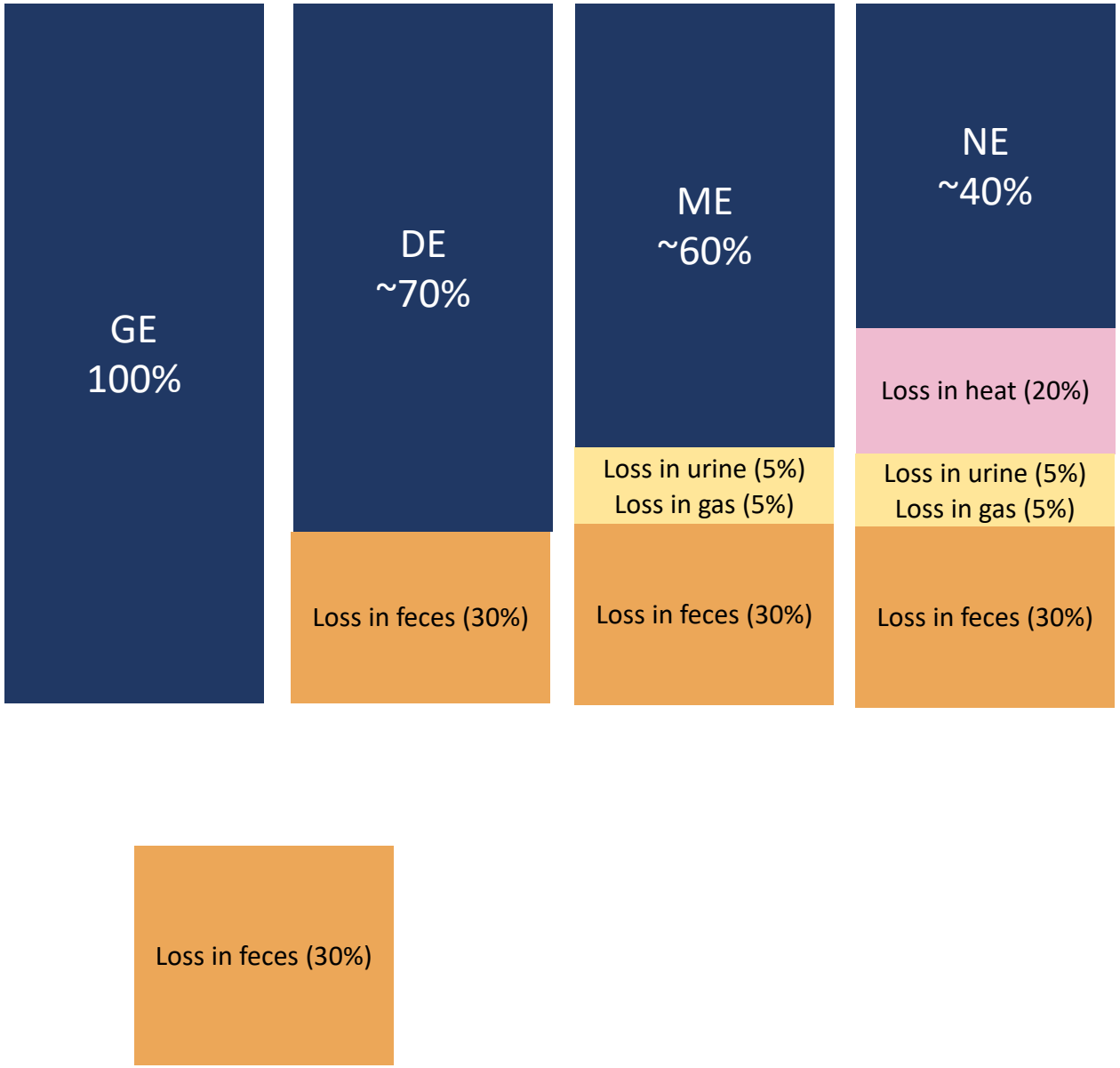
CONSENSUS STUDY REPORT
NUTRIENT REQUIREMENTS OF DAIRY CATTLE
Eighth Revised Edition
ANIMAL NUTRITION SERIES


GE
100%
DE
~70%
ME
~60%
NE
~40%


GE
100%
DE
~70%
ME
~60%
NE
~40%
Loss in feces (30%)
Loss in feces (30%)
Loss in feces (30%)
Loss in urine (5%)
Loss in gas (5%)
Loss in urine (5%)
Loss in gas (5%)
Loss in heat (20%)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Loss in feces (30%)
ME
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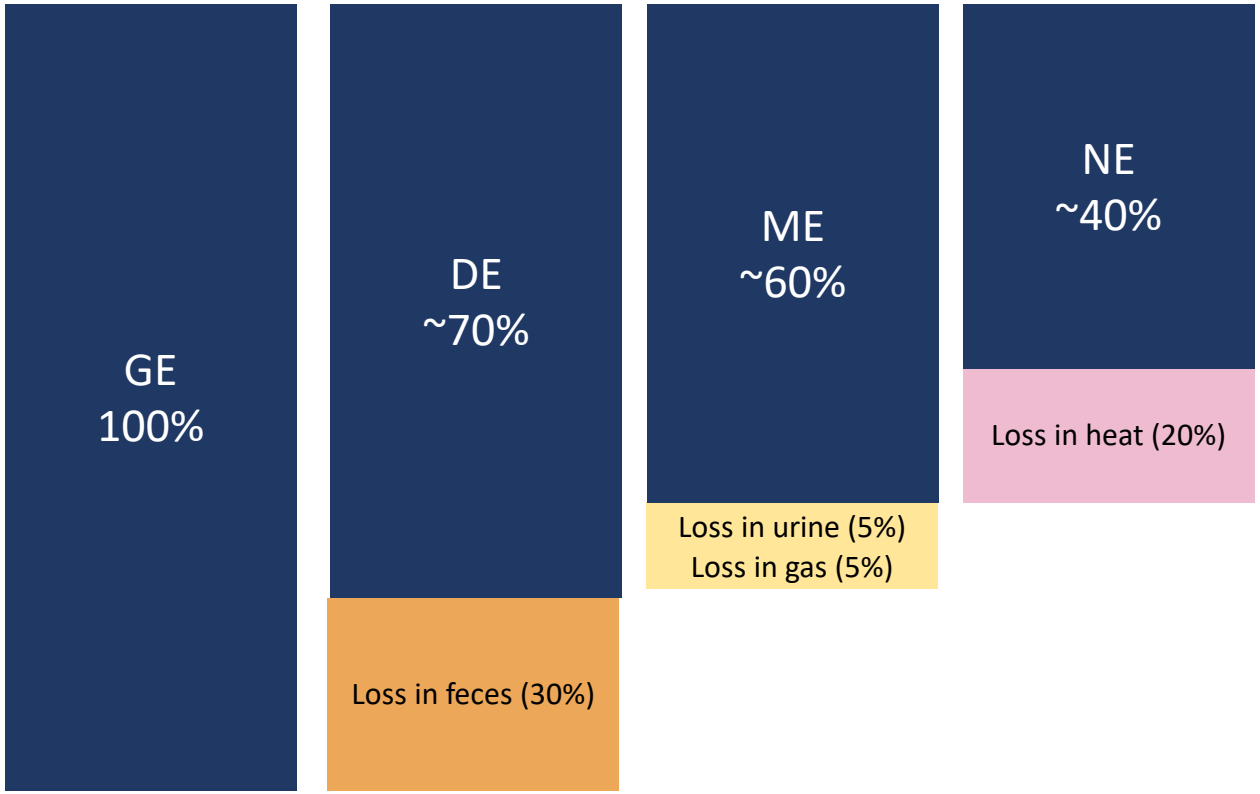
Loss in urine (5%)
Loss in gas (5%)
Loss in feces (30%)
NE
~40%
Loss in heat (20%)
Loss in urine (5%)
Loss in gas (5%)
Loss in feces (30%)
Loss in feces (30%)


GE
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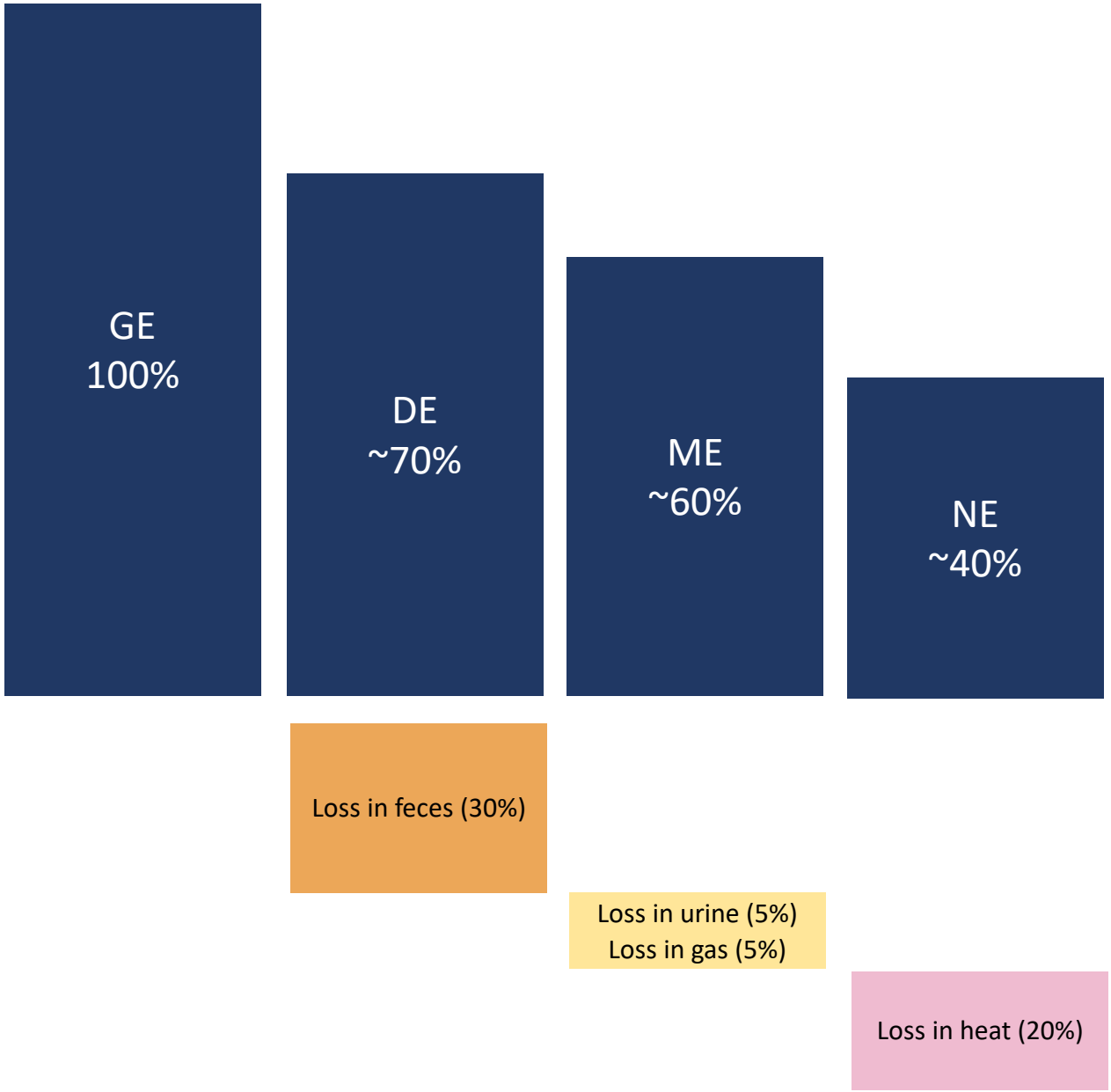
GE
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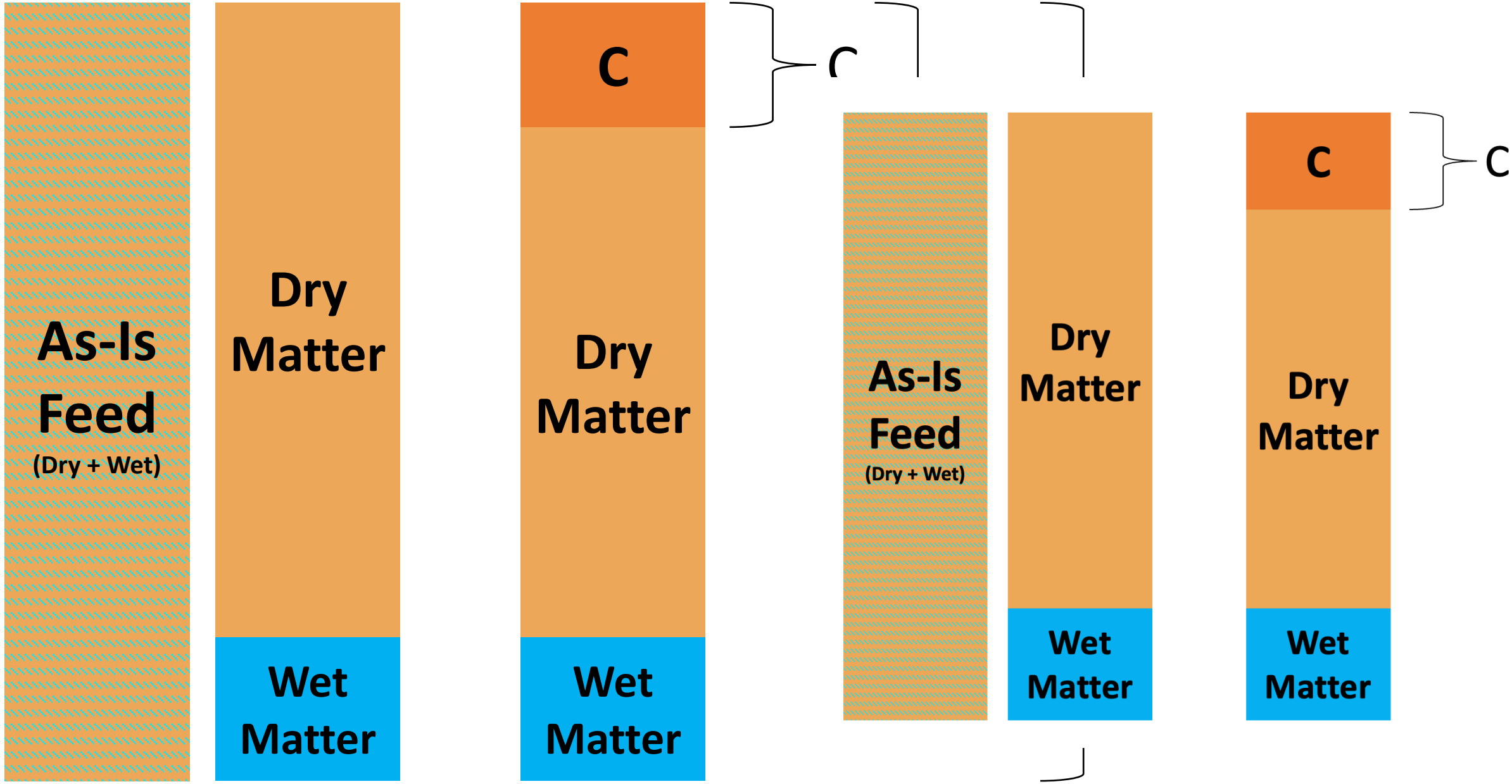
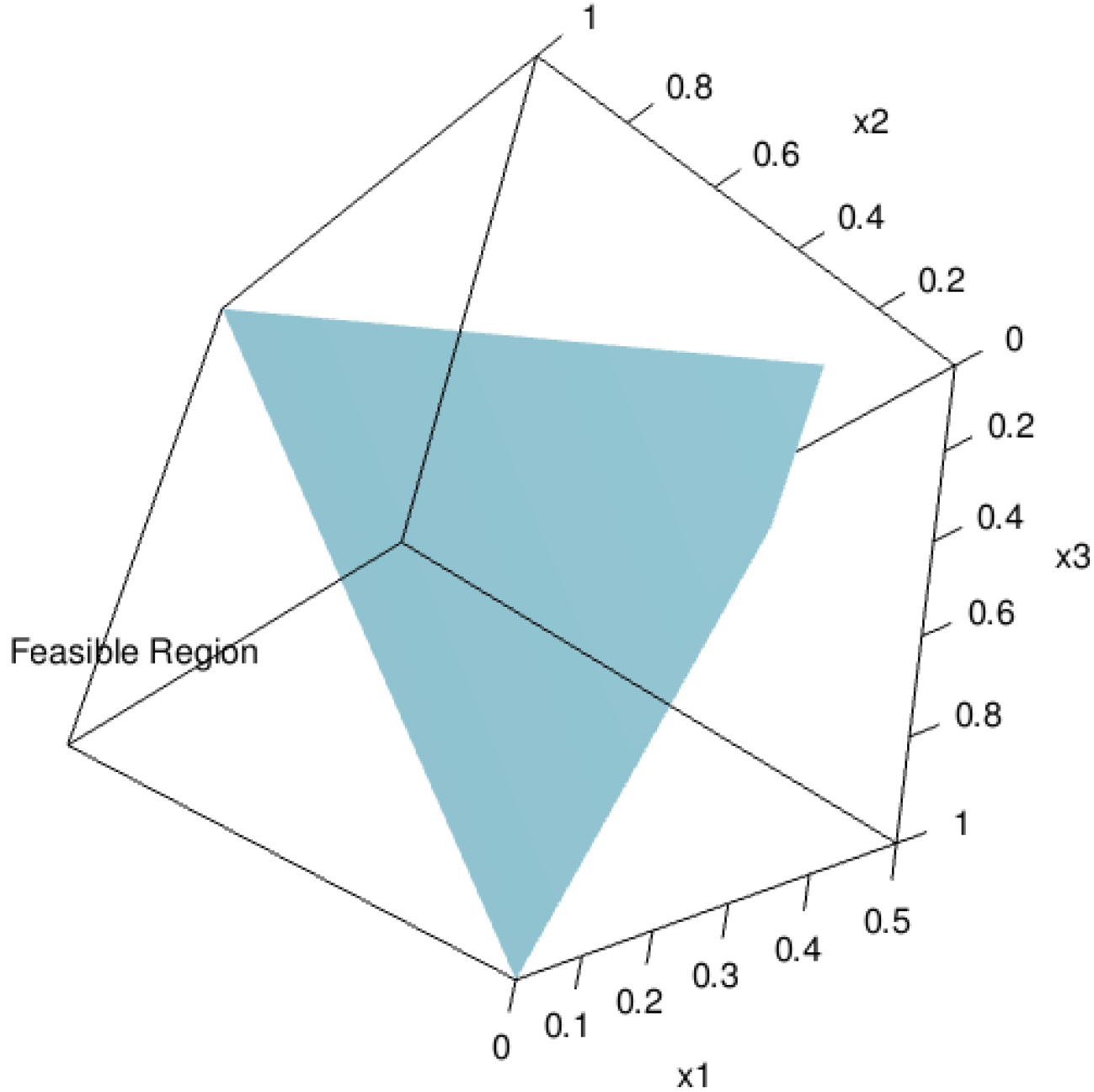
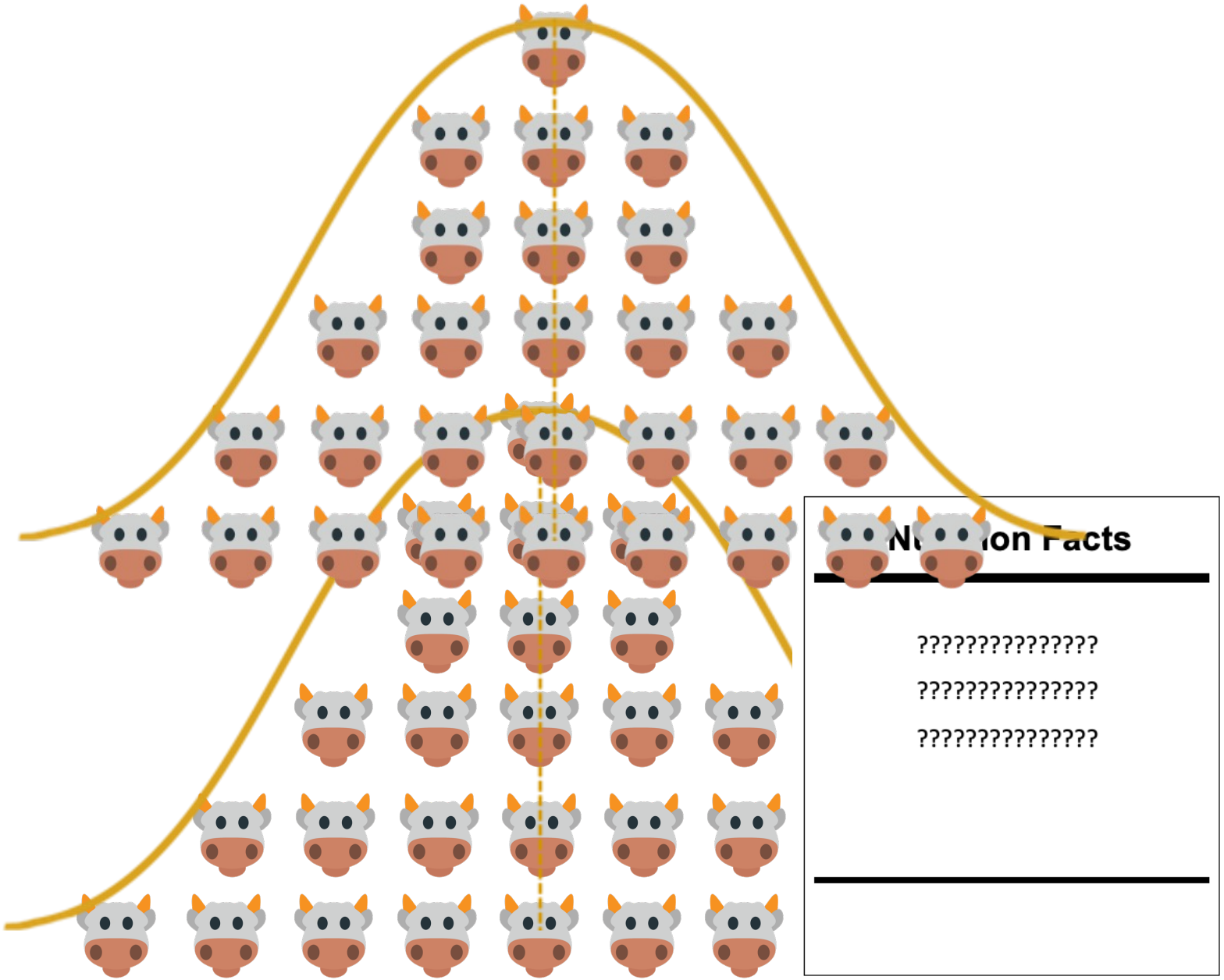

As-Is Feed
(Dry + Wet)
Dry Matter
Wet Matter
C
Dry Matter
Wet Matter
C
As-Is Feed
(Dry + Wet)
Dry Matter
Wet Matter
C
Dry Matter
Wet Matter
C


1
0.8
0.6
0.4
0.2
0
x2
0
0.2
0.4
0.6
0.8
1
x3
Feasible Region
0
0.1
0.2
0.3
0.4
0.5
x1



Nutrition Facts

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Nutrition Facts

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I can’t
read

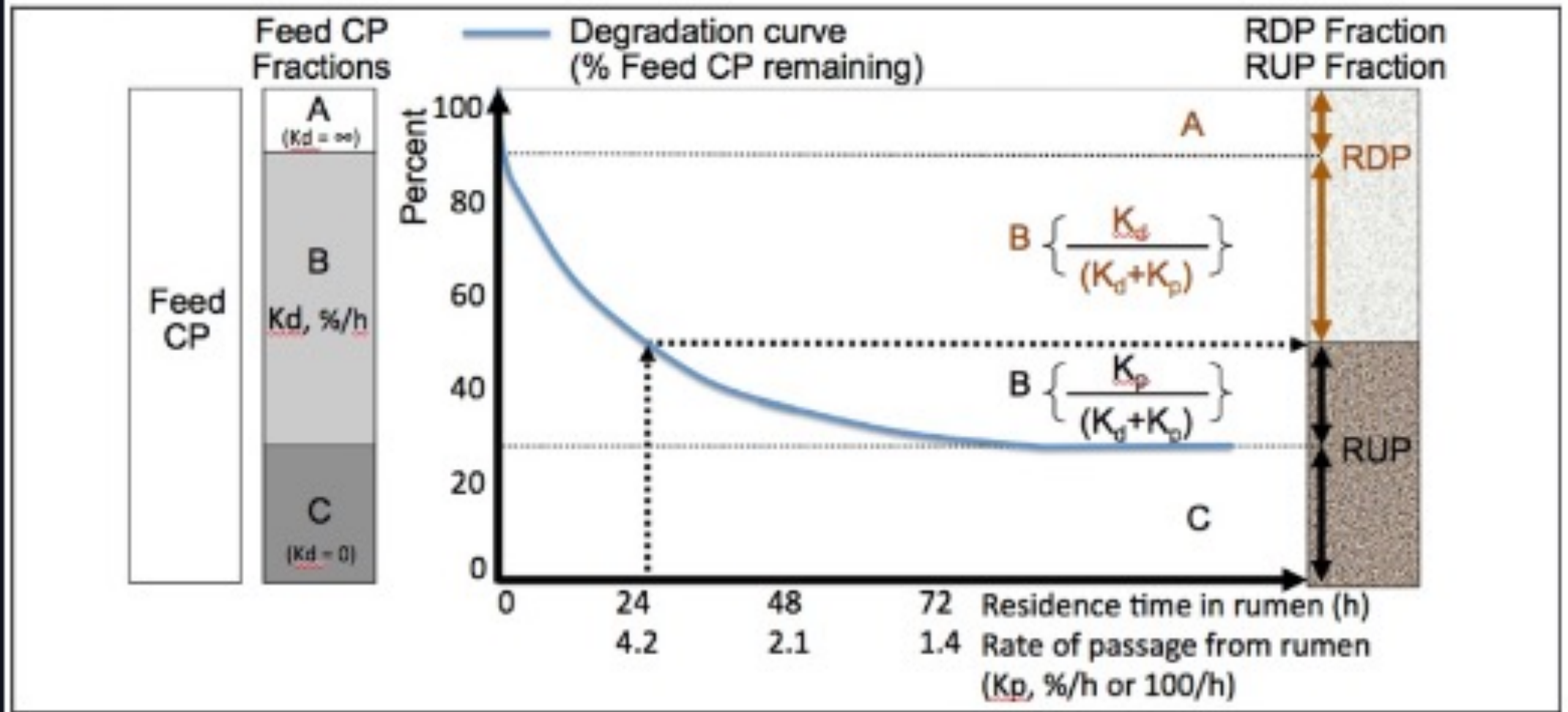
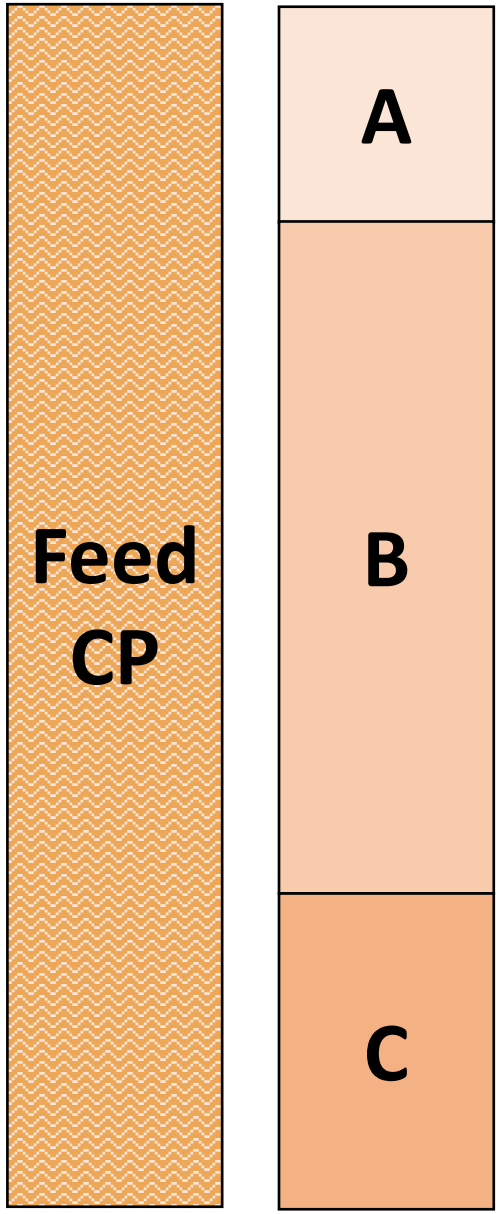


Figure 2: Degradable versus Degraded CP in the rumen.

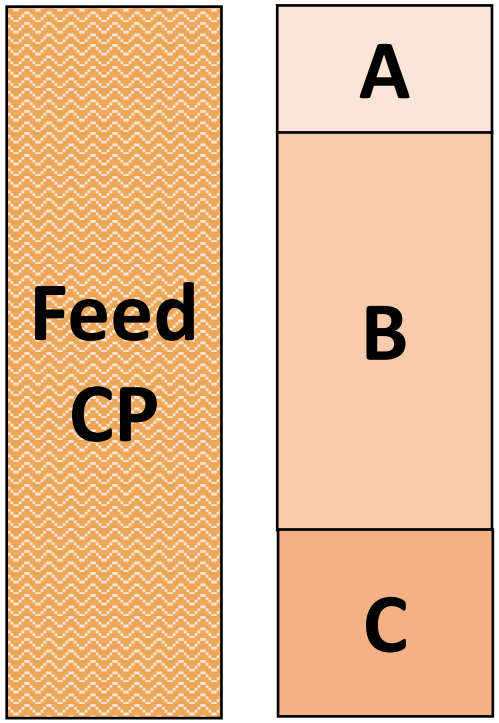


6.4 kg A passage / 100 kg A fraction

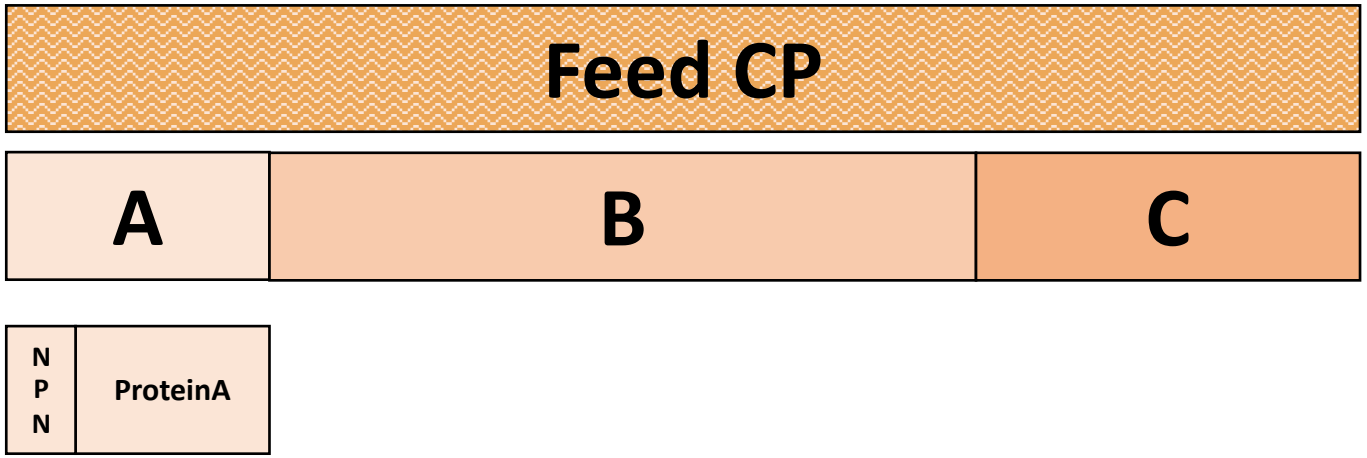
Absorbs or passes quickly

P

	Absorbed	Passes
A	93.6	6.4
B	$\frac{Kd_c}{Kd_c + Kp_c}$	$\frac{Kp_c}{Kd_c + Kp_c}$
C	0.0	100.0



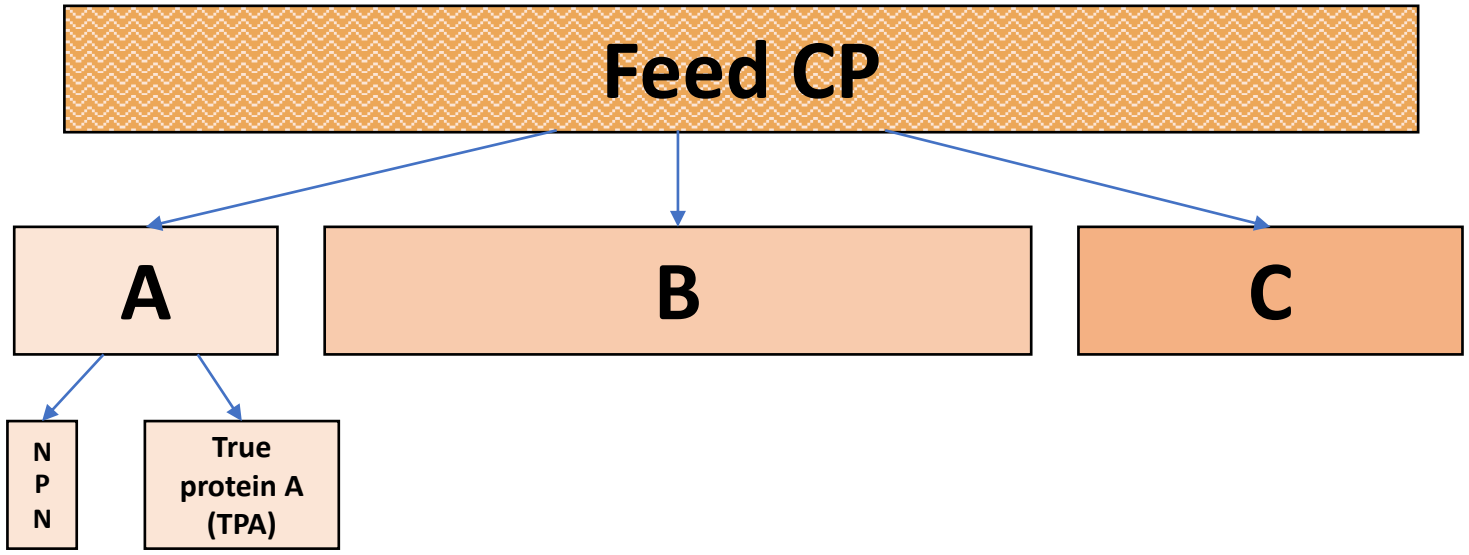
	Absorbed (RDP)	Passes (RUP)
Absorbs or passes instantaneously Fixed percentages absorbed vs. passing	93.6	6.4
Competitive absorption and passage	$\frac{Kd_c}{Kd_c + Kp_c}$	$\frac{Kp_c}{Kd_c + Kp_c}$
None absorbed, all passes	0.0	100.0



Absorbed (RDP)	**NPN** + 93.6***ProteinA**	$\frac{Kd_c}{Kd_c+Kp_c}$ * **B**	0.0 * **C**
Passes (RUP)	6.4***ProteinA**	$\frac{Kp_c}{Kd_c+Kp_c}$ * **B**	100.0 * **C**
	Absorbs or passes instantaneously. Fixed percentages of **A** absorbed vs. passing	Competitive absorption and passage	None absorbed, all passes

f$Fd_RUPIn <- (f$Fd_CPAIn-f$Fd_NPNCPIn) * fCPAdu

Partitioning of CP into A, B, C, and sub-fractions



Kinetic parameters

Kp are specific to the feed type t

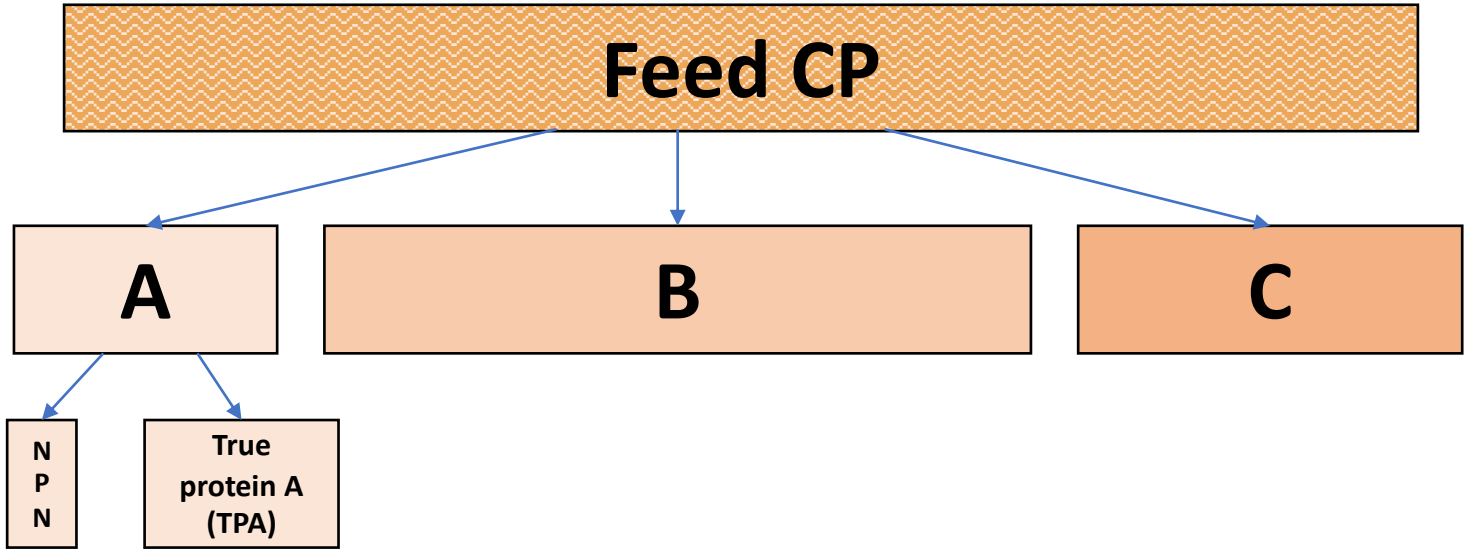
$$Kp_{forage} = 4.87$$

$$Kp_{concentrate} = 5.28$$

Kd are specific to each feed ingredient i (see Feed Tables, NASEM). For example, there is a Kd for "Corn Silage, Typical."

Calculation of RDP and RUP from A, B, C, and sub-fractions and kinetic parameters

Absorbed (RDP)	RDP from A **= NPN** + 93.6***TPA**	RDP from B $= \frac{Kd_i}{Kd_i+Kp_t}$ ***** **B**	RDP from C = 0.0 ***** **C**	RDP total = (RDP from A) + (RDP from B)
Passes (RUP)	RUP from A = 6.4***TPA**	RUP from B $= \frac{Kp_i}{Kd_i+Kp_t}$ ***** **B**	RUP from C = 100.0 ***** **C**	RUP total = (RUP from A) + (RUP from B) + (RUP from C)
Notes	Absorbs or passes instantaneously. Fixed percentages of **A** absorbed vs. passing	Competitive absorption and passage of **B** fraction.	None absorbed, all **C** passes	It should always be true that: CP = (RDP total) + (RUP total) and CP = A + B + C



Kp are specific to the feed type t

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Kd are specific to each feed ingredient i (see Feed Tables, NASEM). For example, there is a Kd for "Corn Silage, Typical."

Absorbed (RDP)	RDP from A **= NPN** + 93.6***TPA**	RDP from B $= \frac{Kd_i}{Kd_i+Kp_t}$ ***** **B**	RDP from C = 0.0 ***** **C**	RDP total = (RDP from A) + (RDP from B)
Passes (RUP)	RUP from A = 6.4***TPA**	RUP from B $= \frac{Kp_i}{Kd_i+Kp_t}$ ***** **B**	RUP from C = 100.0 ***** **C**	RUP total = (RUP from A) + (RUP from B) + (RUP from C)
Notes	Absorbs or passes instantaneously. Fixed percentages of **A** absorbed vs. passing	Competitive absorption and passage of **B** fraction.	None absorbed, all **C** passes	It should always be true that: CP = (RDP total) + (RUP total) and CP = A + B + C

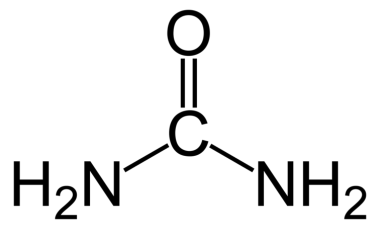
f$Fd_RUPIn <- (f$Fd_CPAIn-f$Fd_NPNCPIn) * fCPAdu

Kd are specific to FEEDS not category. Should have a different subscript.

- Ingestion
- Rumen degradation and passage
- Intestinal digestion and absorption
- Assimilation and/or use

The model describes the core sequences of nutritional processes (ingestion, digestion, absorption, assimilation/use) with respect to protein.

A.



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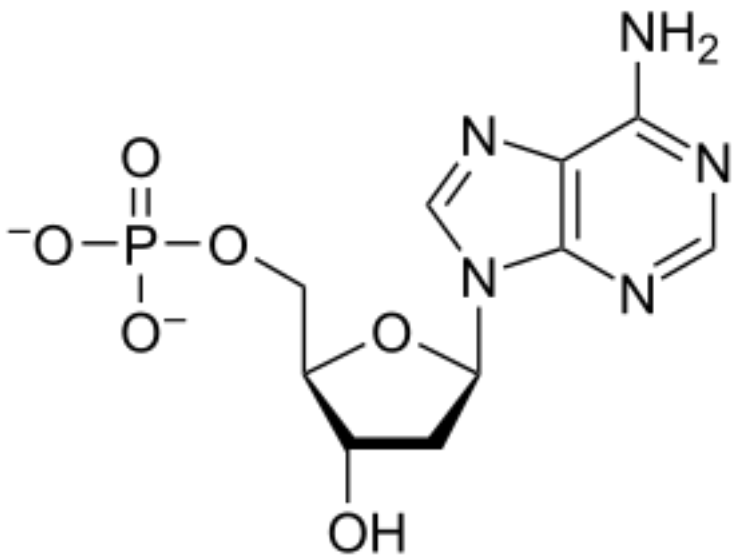

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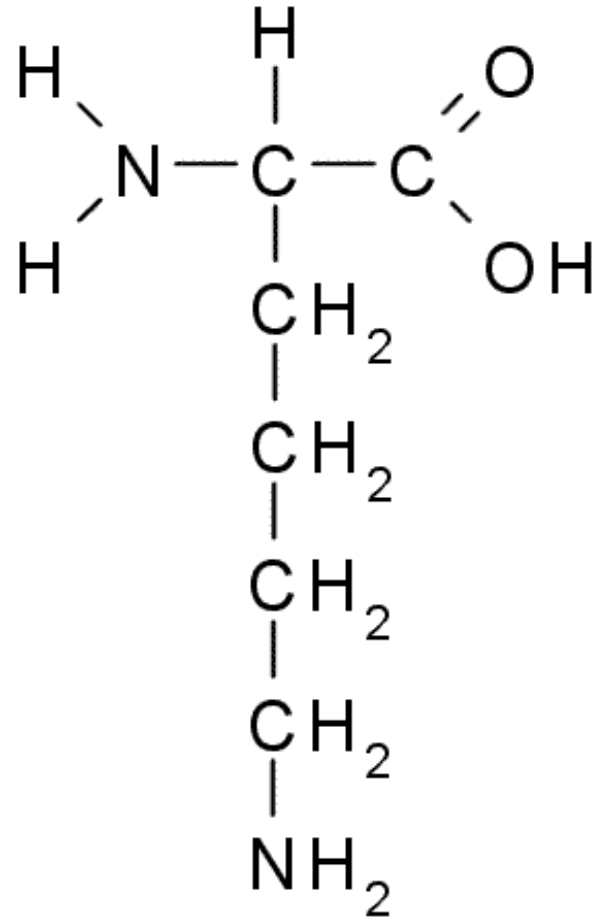

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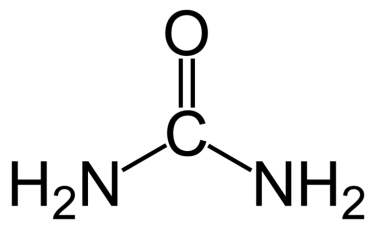

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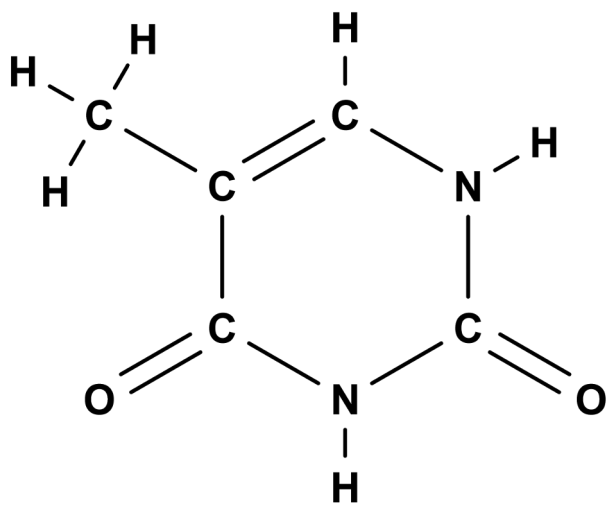

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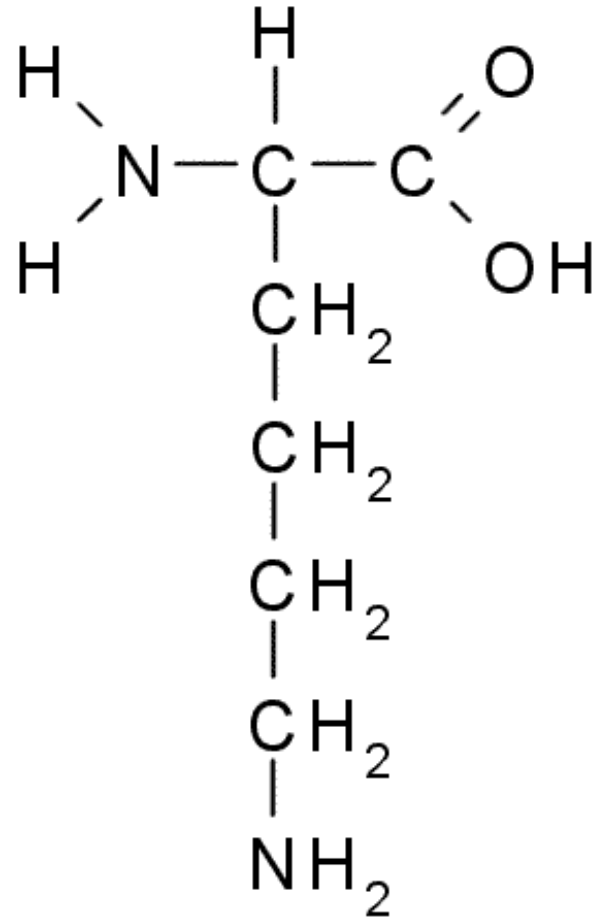

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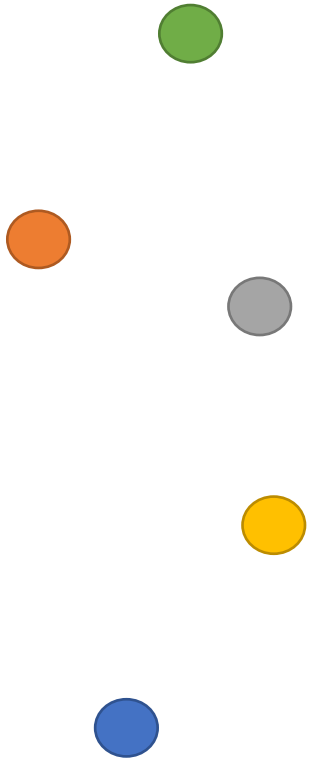

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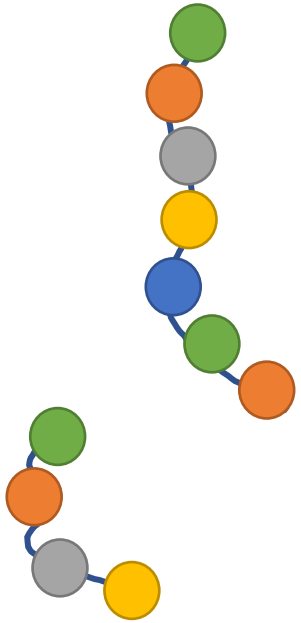
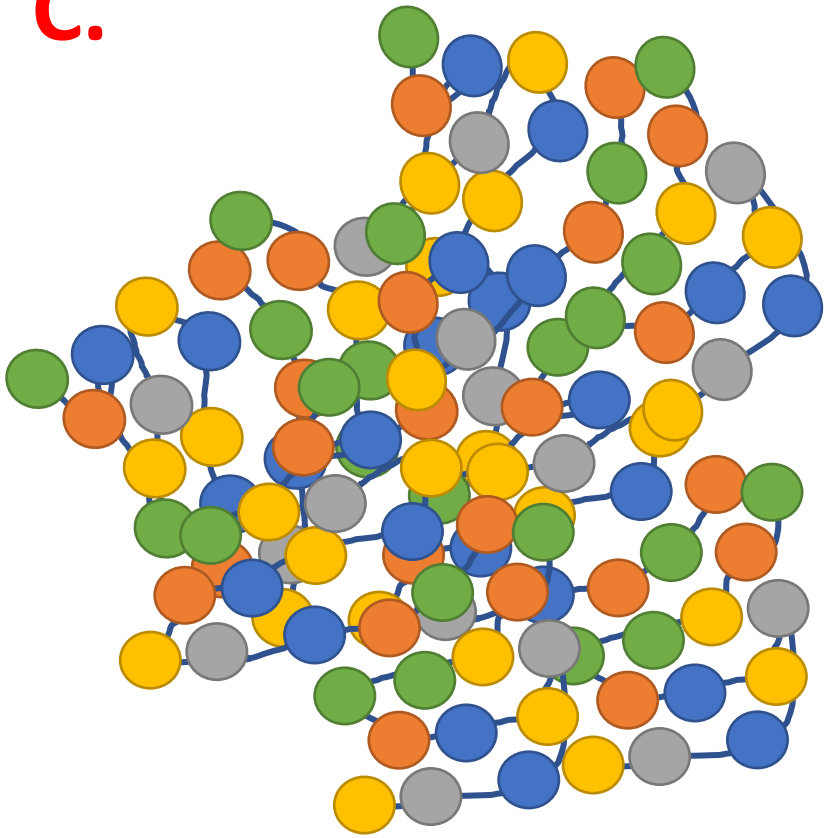
C.