Effects of substitution of kikuyu forage by oat silage on milk production and quality in dairy cows

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Milk production and quality
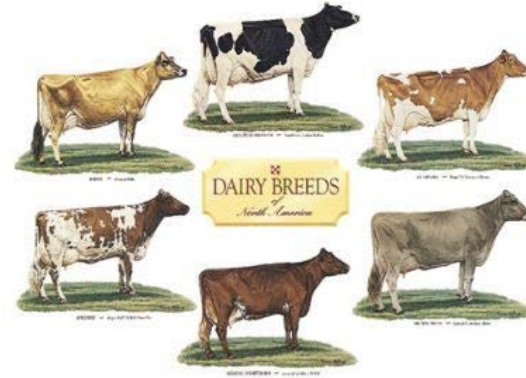
Breed

Feed

Dairy grazing systems

Pasture and forage intake

?

2350 m.a.s.l

Rotational grazing systems

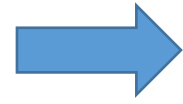African star *(Cynodom nlemfluensis)*

Ryegrass (*Lolium sp.*)

18,8 % CP

14,2 % DM

Kikuyu (*Kikuyocloa clandestina*)

Energy requirements are not covered ➡️ **Concentrate and forage supplementation**

Milk production

✔️ High-quality forage supplementation

Milk production

Usual in the highlands of Costa Rica

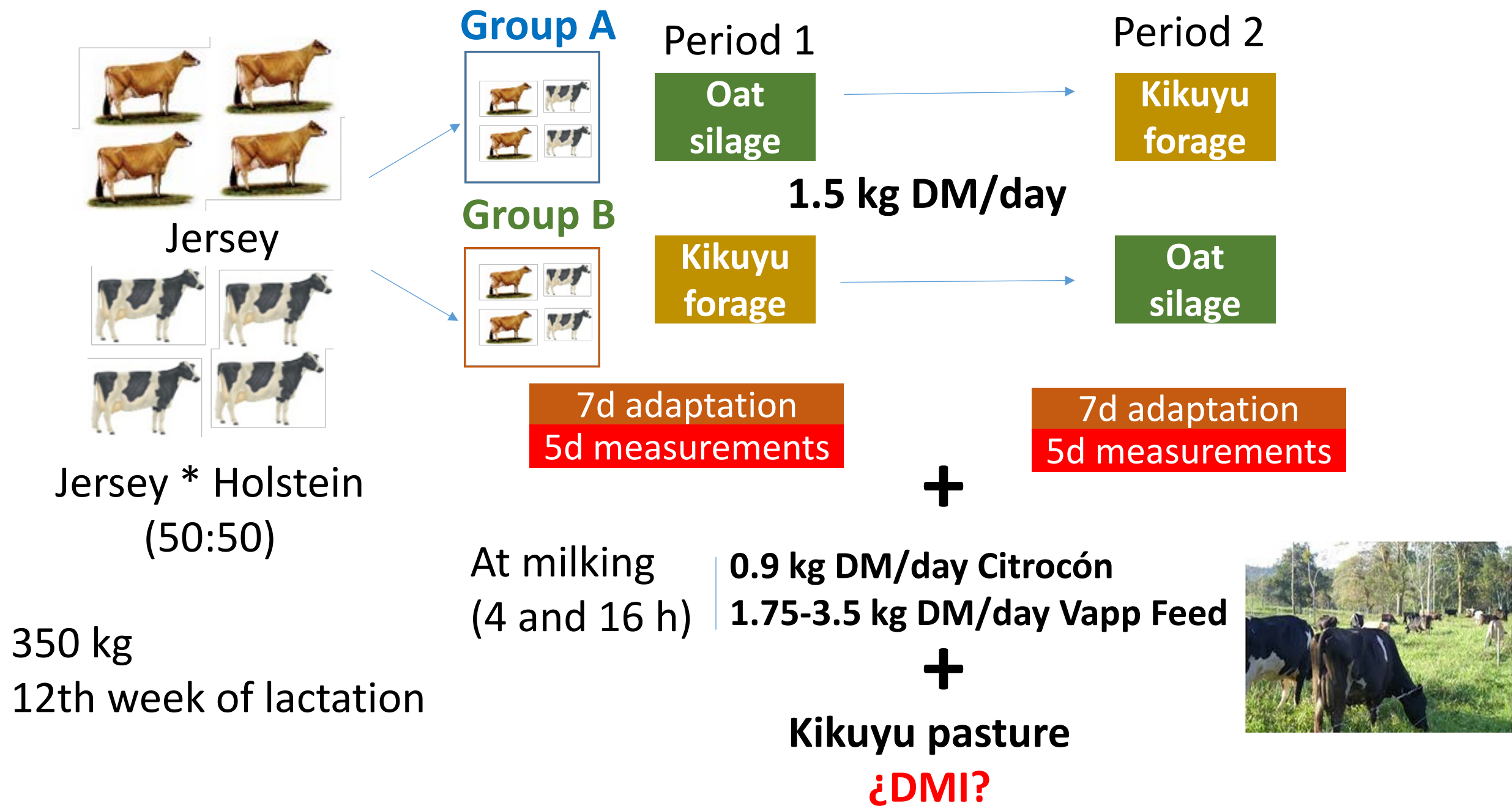Mature kikuyu forage → **Oat silage??**

❌ Low-quality forage supplementation

To determine the effects of supplementation with oat silage or kikuyu forage on

- kikuyu pasture dry matter intake

- milk production and quality

- urinary excretion of purine derivatives

Materials and methods

Jersey

Jersey * Holstein
(50:50)

350 kg
12th week of lactation

Group A

Group B

Period 1

Period 2

Oat silage → Kikuyu forage

1.5 kg DM/day

Kikuyu forage → Oat silage

7d adaptation
5d measurements

7d adaptation
5d measurements

+

At milking
(4 and 16 h)

0.9 kg DM/day Citrocón
1.75-3.5 kg DM/day Vapp Feed

+

Kikuyu pasture

¿DMI?

Materials and methods

Sample	Analysis
Kikuyu pasture, kikuyu forage, oat silage, Citrocón and Vapp Feed	DM, CP, OM, NDF, ADF, **NE_L**
Milk	Fat, protein, lactose
Urine	Purine derivatives

Statistical analysis: PROC GLM of SAS v. 9.2

Model: $y = \mu + T_i + P_j + A_{k(ij)}$

T_i = fixed effect of treatment (oat silage or kikuyu forage)

P_j = fixed effect of period of supplementation

$A_{k(ij)}$ = random effect of animal nested within treatment and period

Materials and methods

DM intake estimation of kikuyu pasture

Requirements (NRC, 2001):

- ✓ **Maintenance: 0.080 Mcal NE_L/kg $BW^{0,75}$**
- ✓ **Milk production:**
  NE_L **(Mcal/kg) = 0,0929 * % Fat + 0,057 * % Protein + 0,0395 * % Lactose**
- ✓ **No changes in BW assumed (INRA, 1988)**

NE_L **Requirements (per day) =**
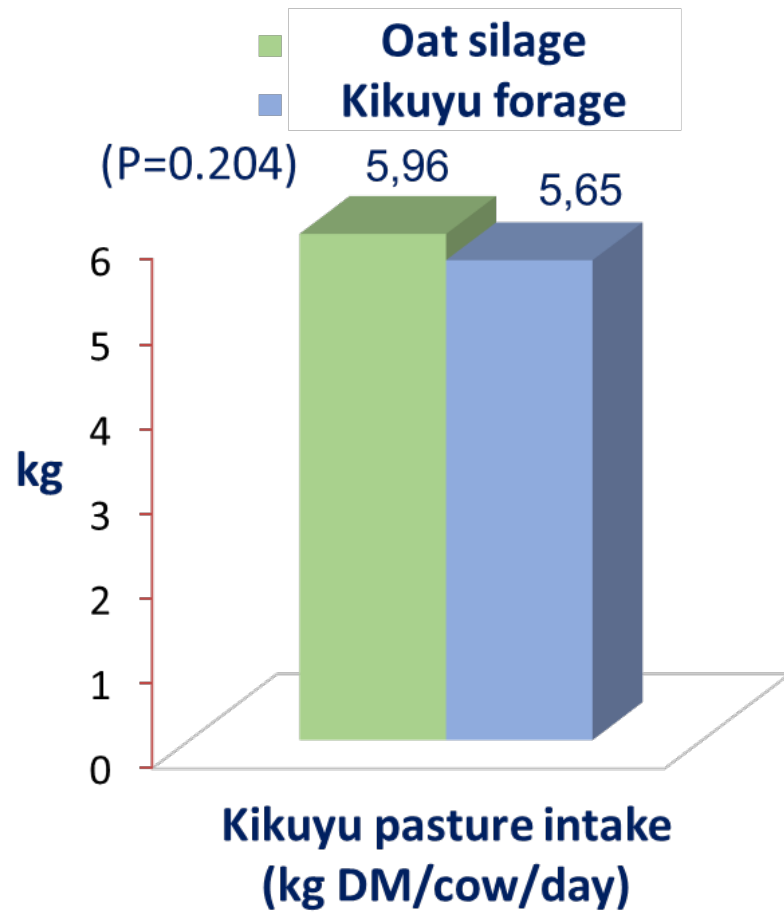NE_L **concentrates + NE_L forages + NE_L kikuyu pasture**

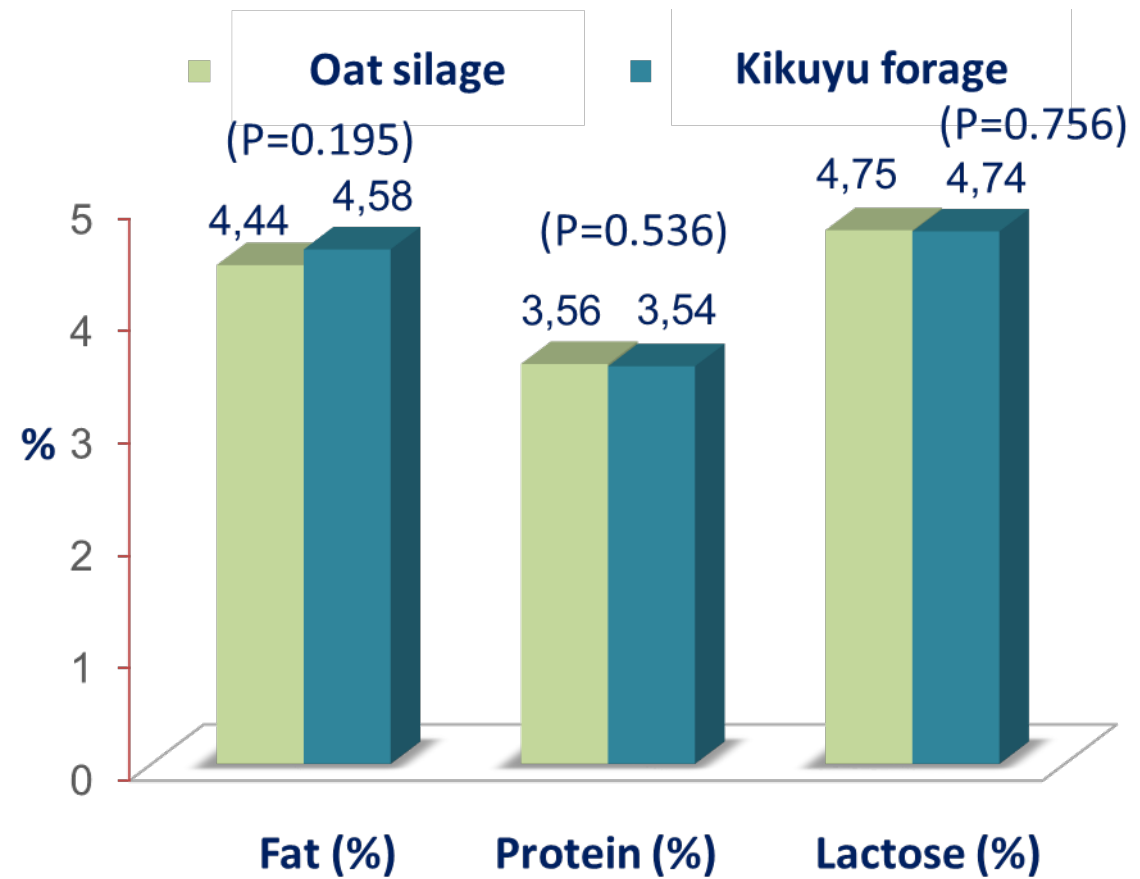$$\frac{\text{Daily } NE_L \text{ requirements from pasture}}{NE_L \text{ \underline{content} of grazed kikuyu}} = \text{Intake of kikuyu pasture (DM)}$$

Pasture intake

Milk composition

Animal effect (P<0.05)

Milk production
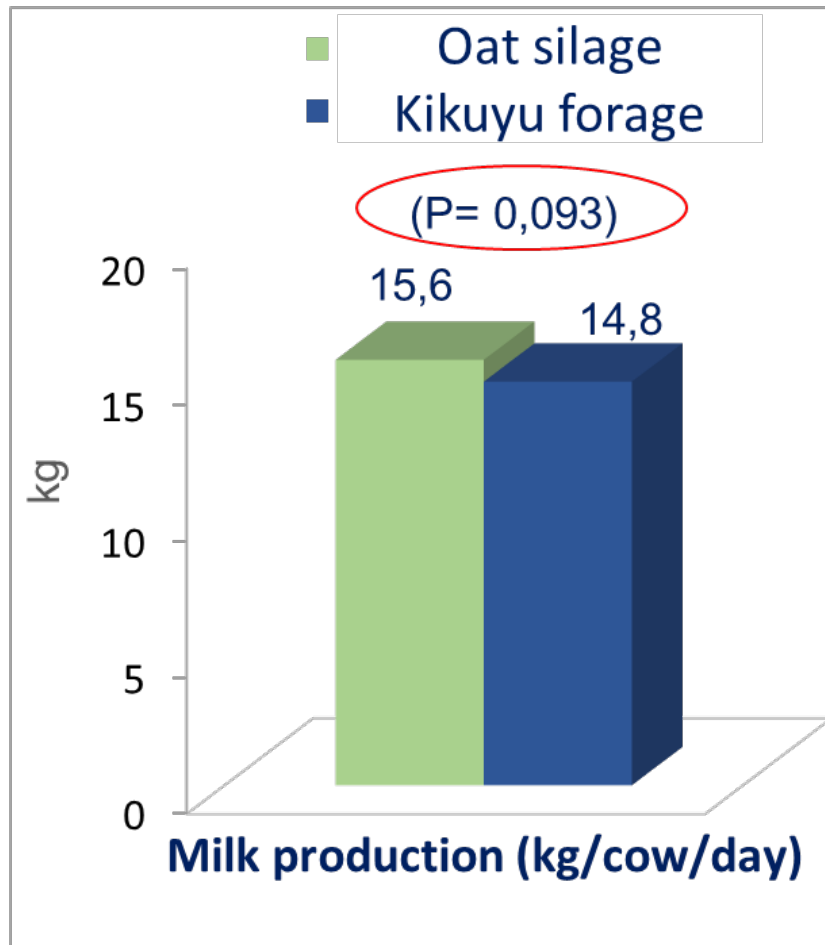
Daily production of protein and lactose

Milk production — Oat silage: 15,6; Kikuyu forage: 14,8 kg/cow/day (P= 0,093)

Daily production — Protein (g/cow/day): Oat silage 555, Kikuyu forage 524 (P= 0,043); Lactose (g/cow/day): Oat silage 741, Kikuyu forage 702 (P= 0,021)
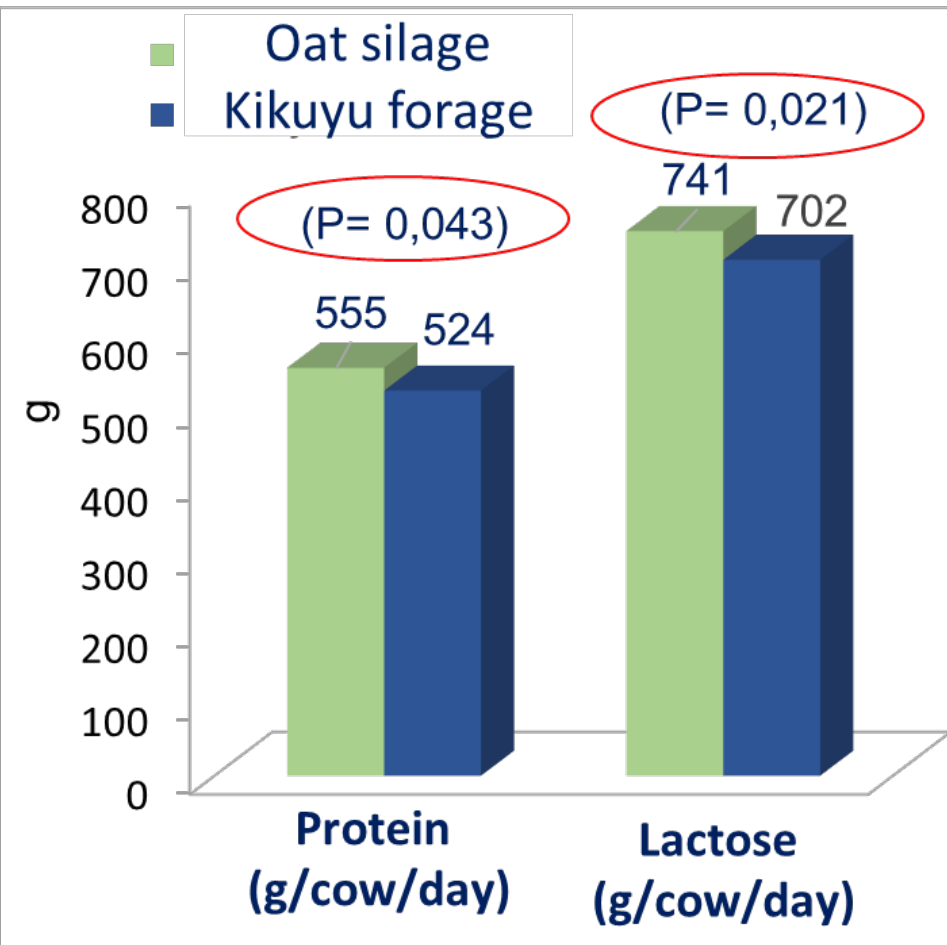
Animal effect and grazing period (P > 0.1)

Purine derivatives
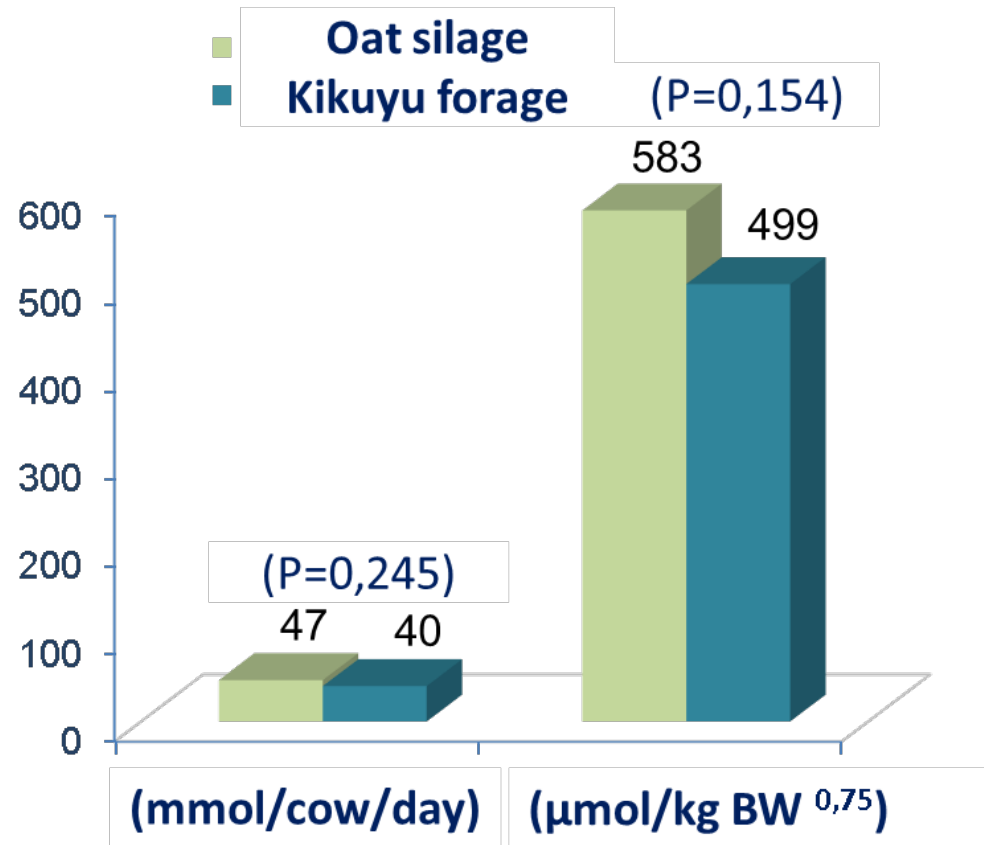
- Oat silage
- Kikuyu forage → ≈ Metabolizable fermentable energy

Xanthine Hypoxanthine → Degradation to Uric acid Allantoin

Animal effect (P> 0.1)

- **Substitution of kikuyu forage by oat silage seems to be an advisable practice for dairy milk producers in the highlands of Costa Rica.**

Thank you for your attention

Chemical composition and estimated NE$_L$ of the feedstuffs

	OM	CP	NDF	ADF	EN$_L$
Period 1					
Grazed kikuyu	87.67	21.47	56.53	25.82	1.61
Oat silage	89.34	7.18	63.56	43.81	1.05
Kikuyu forage	89.38	7.52	69.53	36.93	1.14
Vapp Feed concentrate	94.15	19.70	12.34	5.67	2.12
Citrocón concentrate	93.32	6.54	19.70	18.29	1.76
Period 2					
Grazed kikuyu	86.42	25.20	53.01	24.71	1.63
Oat silage	86.15	8.26	64.38	42.22	1.08
Kikuyu forage	86.95	7.14	65.42	49.96	1.07
Vapp Feed concentrate	93.97	19.55	12.03	5.58	2.10
Citrocón concentrate	93.45	6.51	19.02	18.15	1.69

OM: organic matter; CP: crude protein; NDF: neutral detergent fibre; ADF: acid detergent fibre; ADL: acid detergent lignin; EE: ether extract;
NE$_L$: net energy for lactation (Mcal/kg dry matter), estimated according to the NRC (2001); n.d.: not determined