

# Potential of Maremmana cattle for organic beef production

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# BACKGROUND

Maremmana is a slow-growth Italian native cattle breed adapted to the environmental constraints of marginal hilly areas of central Italy where plays a major role in agricultural economy.



Organic livestock farming

Local animal genetic resources

Internal farm sources

Scarce or no use of expensive organic protein sources

Young bulls are mostly fed diets based on home grown forages and cereals

# Possible solution

## Introduction of legume crops into production system and in animal diet

- Good quality protein source
- Increasing of soil nitrogen concentration

## Chickpea (*Cicer arietinum*)

- Low technical input required
- Good source of protein, carbohydrates, Ca, P.



# OBJECTIVE

Evaluate the effects of the inclusion of chickpea in the finishing diets of Maremmana young bulls organically farmed.

- ▶ Growth performance
- ▶ Meat quality
- ▶ Farm income

# MATERIALS AND METHODS

On farm study.

Extensive organic farm (200 ha, 219 Maremmana heads), located in Tarquinia, Lazio Region, Central Italy



**Twelve Maremmana young bulls**

270<sub>-</sub>8.1 d of age

239<sub>-</sub> 31.4 kg BW

**Barley diet**

(farmer's diet)

**Chickpea diet**



Animal's weight and dry matter intake were recorded every three weeks.

# Diets

	Body Weights of bulls (kg)							
	200-300		300-400		400-500		500-600	
<i>Feed (kg/d)</i>	Chickpea diet	Barley diet	Chickpea diet	Barley diet	Chickpea diet	Barley diet	Chickpea diet	Barley diet
<b>Alfalfa hay</b>	4.5	4.5	6.0	6.0	7.0	7.0	8.0	8.0
<b>Chickpea meal</b>	1.75	-	1.5	-	1.5	-	1.5	-
<b>Barley meal</b>	-	1.75	-	1.5	-	1.5	-	1.5
<b>Maize meal</b>	1.25	1.25	3.5	3.5	3.5	3.5	4.5	4.5

# Nutritional characteristics

	Body weight of bulls (kg)							
	200-300		300-400		400-500		500-600	
	Chickpea diet	Barley diet	Chickpea diet	Barley diet	Chickpea diet	Barley diet	Chickpea diet	Barley diet
<b>Meat FU /kg DM</b>	0.81	0.80	0.82	0.81	0.83	0.83	0.85	0.84
<b>CP (%DM)</b>	13.7	11.1	12.7	11.0	12.4	10.9	12.1	10.9
<b>Starch (%DM)</b>	21.4	25.4	24.2	26.8	26.3	28.5	27.8	30.0



## **Prefixed slaughtering body weight: 630 kg**

Carcasses were scored for **conformation** (E.U.R.O.P.) and **fat grade** (1=low to 5=very high).

## **Meat quality on 7 days aged *Longissimus thoraci***

- **Color parameters** (colorimeter Minolta CR200 –D65: illuminant- CIE,1986)
- **Drip loss** (gravimetric method on raw meat preserved at 5°C for 48h (Barton-Gade et al., 1993))
- **Cooking loss** (water bath at 75°C for 50')
- **Warner Bratzer Shear force** on raw and cooked meat

# Statistical analyses

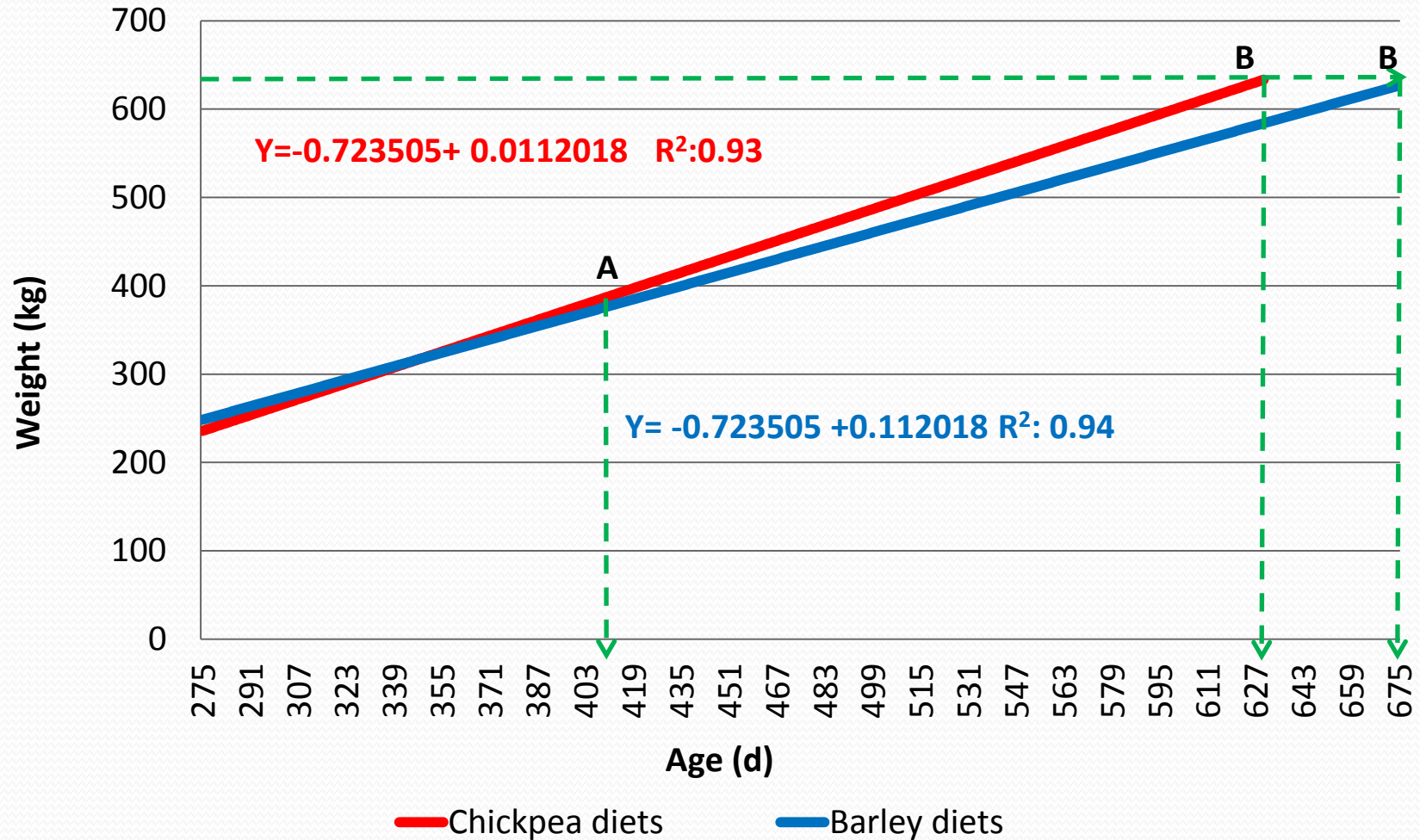
- Average Daily Gain (ADG), Dry Matter Intake (DMI), carcass traits and meat quality parameters were analyzed by one-way ANOVA (diet effect);
- Average growth curves: regression of weight against time (PROC REG, SAS 2001). Regression slopes were compared with the F-test;
- Carcass conformation and fatness scores were analyzed by the Kruskal-Wallis test (PROC NPARIWAY, SAS 2001).

# RESULTS

## Growth performances

	Chickpea diet	Barley diet	ES	P values
<b>ADG (g/d)</b>	1147	989	62.4	0.110
<b>Age at slaughtering (d)</b>	619	656	8.6	0.015
<b>Length of finishing period (d)</b>	341	382	5.03	0.0001

# Growth curves



**A:** significant difference

**B:** slaughtering weight

# Carcass

	Chickpea diet	Barley diet	ES	P values
<b><i>Carcass traits</i></b>				
<b>Carcass weight (kg)</b>	331	322	12.6	ns
<b>Dressing percentage (%)</b>	53.3	52.5	0.92	ns
<b><i>Carcass score</i></b>				
<b><sup>1</sup> Conformation</b>	3.0	2.3		0.019
<b><sup>2</sup> Fat grade</b>	3.5	2.5		0.010

<sup>1</sup> 1= poor to 5= excellent; <sup>2</sup> 1= minimum to 5= maximum; ns: non significant

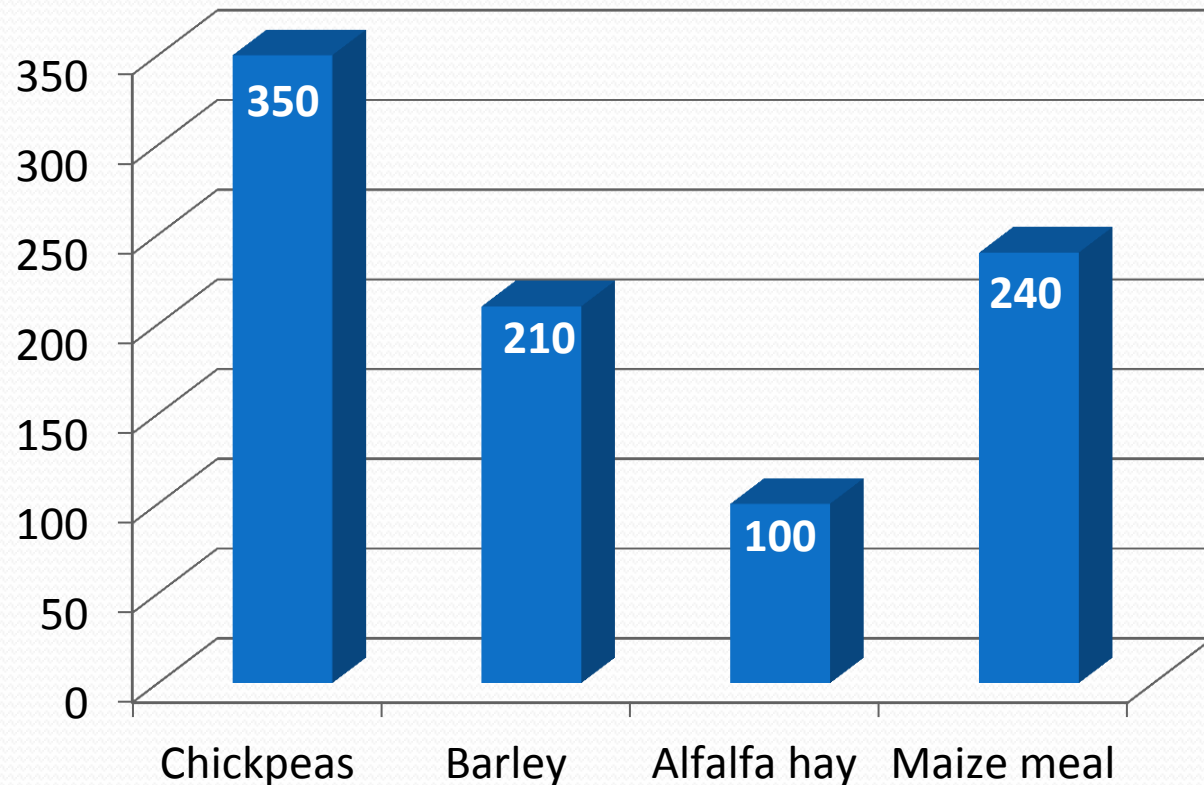
# Meat quality

	Chickpea diet	Barley diet	ES	P values
<b><i>Colour</i></b>				
L*	39.26	40.65	1.36	ns
a*	7.52	8.91	0.79	ns
b*	11.67	12.81	0.83	ns
<b><i>Water holding capacity</i></b>				
Drip loss (%)	0.99	1.70	0.21	0.034
Cooking loss (%)	29.28	24.45	1.1	0.066
<b><i>Warner-Bratzel shear force</i></b>				
Raw meat (kg)	2.8	3.3	0.21	ns
Cook meat (kg)	6.5	6.6	0.78	ns

# Costs and benefits

	Chickpea diet	Barley diet	Δ
<b><i>Feed consumption (kg/head)</i></b>			
Chickpea/ Barley	548	615	-67
Alfalfa hay	1223	1395	-315
Maize meal	2360	2675	-172

**Feed costs (€/t)**



	Chickpea diet	Barley diet	Δ
<b><i>Feed costs (€/head)</i></b>			
<b>Chickpea/Barley</b>	192	129	+63
<b>Alfalfa hay</b>	236	268	-62
<b>Maize meal</b>	294	335	-41
<b>TOTAL</b>	<b>722</b>	<b>732</b>	<b>-10</b>

	Chickpea diet	Barley diet
<b>Carcass price* (€/100kg)</b>	<b>313</b>	<b>286**</b>
<b>Income (€/head)</b>	<b>303</b>	<b>199</b>

\*Price of conventional carcass graded as R and O on Italian market.

\*\*Price weighted for the detected proportion of R and O carcasses



# CONCLUSIONS

## Chickpea fed bulls showed

Improved growth performances and better conformed carcasses

The higher dietary protein level resulted in better muscle development

Antinutritional compounds (protease inhibitors, lectins) appear to be inactivated by rumen fermentations

Carcasses with higher fatness score

Excessive energy intake in the last phase of finishing period

Meat quality was unaffected by dietary treatment

Shorter finishing length

Reduction of feed consumption

Reduction of feeding cost

Better conformed carcasses

High sale price

The use of chickpea can improve farm income

# Thank you

# Questions?

