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# Local pig breeds: nutritional requirements, innovative practices and local feeding resources as challenges in project TREASURE

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# Local (autochthonous) pig breeds

- a heritage of agricultural biodiversity
- not competitive (low productivity)
- variety of rearing systems adapted to local agro-geo-climatic conditions
- preservation often assured via subsidies (public money)
- self-sustainability with agricultural use



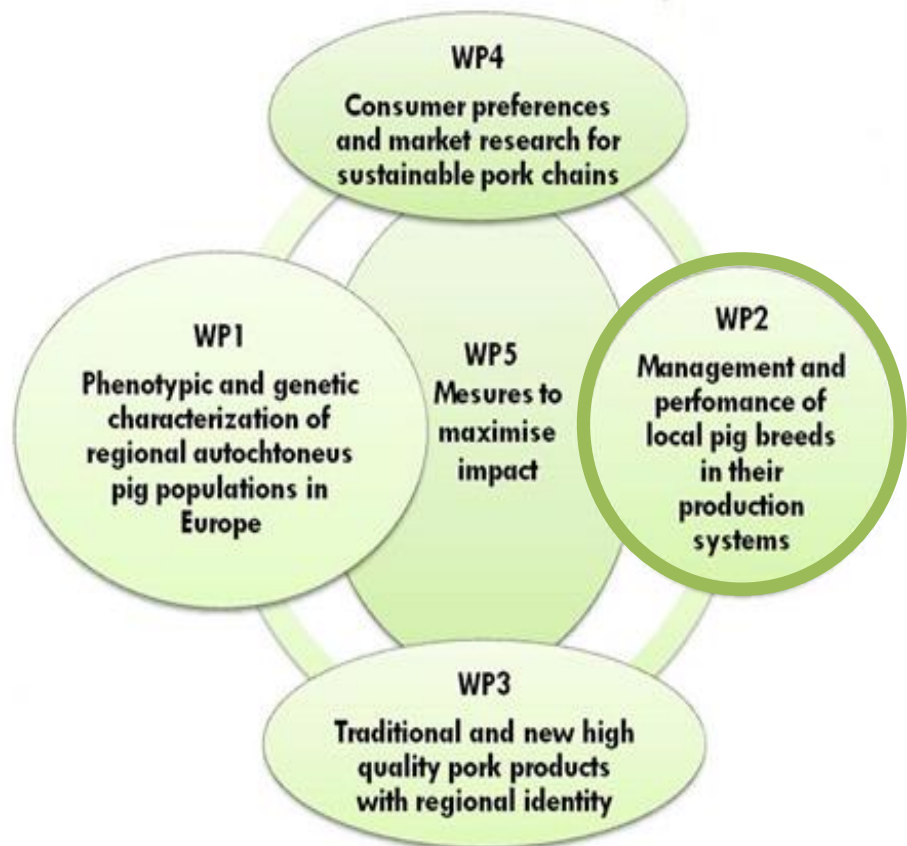
Idea & challenge  
for project TREASURE



**TREASURE** is a RIA project of H2020 devoted to traditional genetic resources in pig production.



improve the potentials of local pig breeds (esp. untapped) for their enhanced use



- *performances*
- *nutrition (requirements)*
- *use of locally available feeding resources => product quality*
- *innovative management practices => welfare*



- **15 experiments on 12 breeds**

a) *Nutritional requirements of growing pigs and reproductive sows*

b) *Innovative practices*

c) *Housing/rearing conditions*

d) *Locally available feeding resources*

Highlights of  
first results

# a) Nutritional requirements of growing pigs and reproductive sows



- little is known about the nutritional requirements of local pig breeds
- metabolic trials conducted on two model breeds – *Iberico* and *Cinta Senese*

I. Protein requirements of Cinta Senese **growing pigs**

II. Protein requirements of Iberico **growing pigs**  
(immunicastrated male and female)

III. Protein requirements in **lactating Iberico sows**

IV. **Modelling studies** with InraPorc®



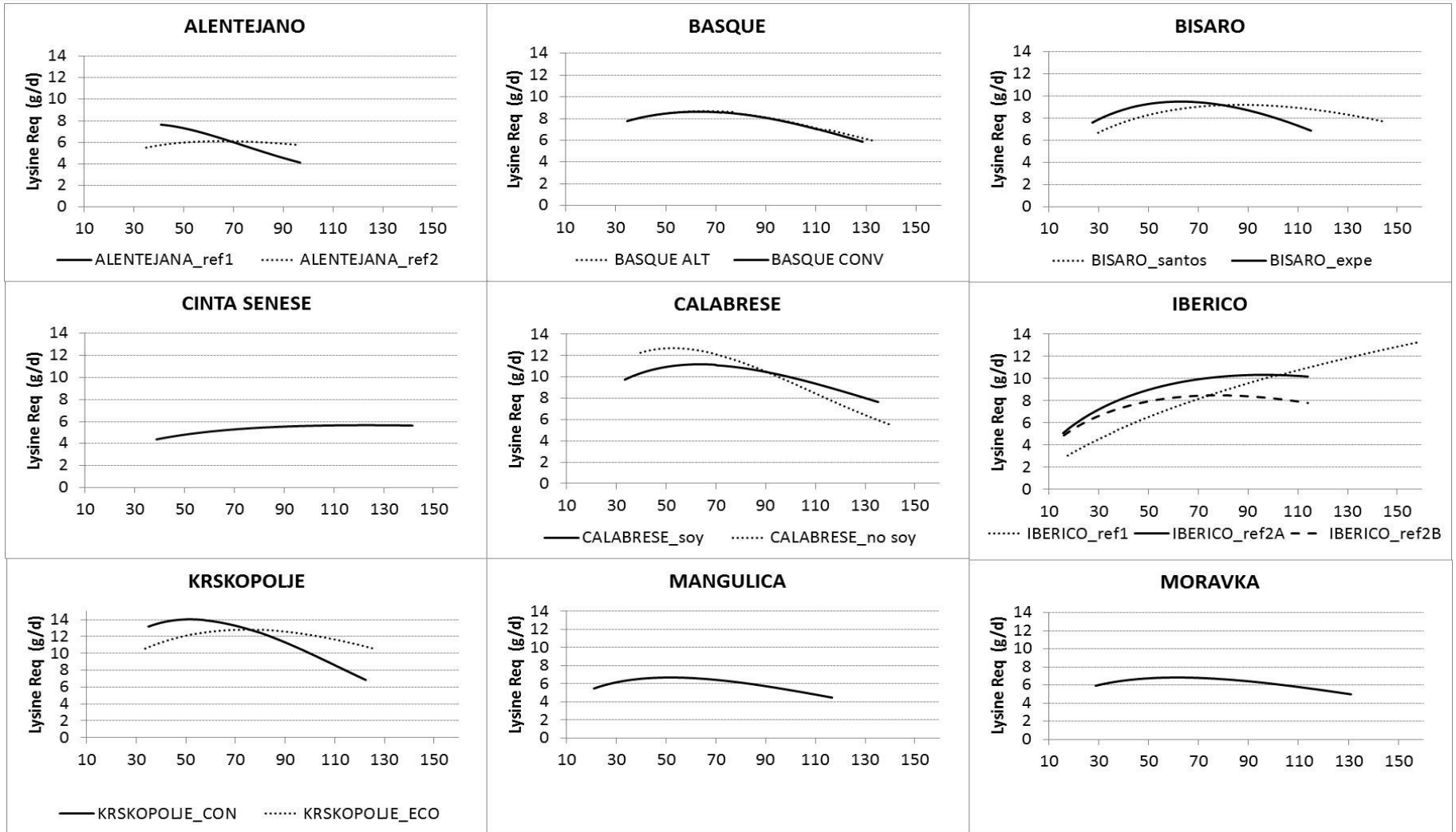
# a) Nutritional requirements of growing pigs and reproductive sows

Objective	Breed	Highlights on first available results
1. Protein requirements in immunocastrated males and females	Iberian	<ul style="list-style-type: none"> <li>• No differences in ADG and FE between protein treatments (12-16%)</li> <li>• Higher ADG and FE of IC_males than SC and IC_females.</li> <li>• Plasma urea decreased in pigs of three sexes fed on lower protein diets</li> <li>• N balance results will elucidate if protein requirements differ among immunocastrated and surgically castrated male pigs.</li> </ul>
2. Protein requirements in lactating sows	Iberian	<ul style="list-style-type: none"> <li>• No results available yet</li> </ul>
3. Protein requirements in growing pigs	Cinta Senese	<ul style="list-style-type: none"> <li>• Growth rate (30-60 kg) higher in pigs fed iso-energetic diet with less proteins (12 vs. 18% proteins)</li> <li>• Cuts weights and the percentage of the main tissues were similar between diets.</li> </ul>
4. Modelling studies Breeds: Alentejano, Bisaro, Iberico, Krškopolje, Mangulica, Moravka, Cinta Senese, Apulo Calabrese		<ul style="list-style-type: none"> <li>• mean protein deposition (PD) lower than in modern breeds. The values spanned from 40–110 g PD/day with the lowest values observed for Mangulica, Moravka, Cinta Senese and Alentejano (&lt;50g PD/day), and highest for Krškopolje and Apulo Calabrese (&gt;80 g PD/day)</li> <li>• precocity indicator lower (than in modern breeds)</li> </ul>

Presentation later

# Growth modelling studies with InraPorc®

## Example: LYS requirements from 40-100 kg LW



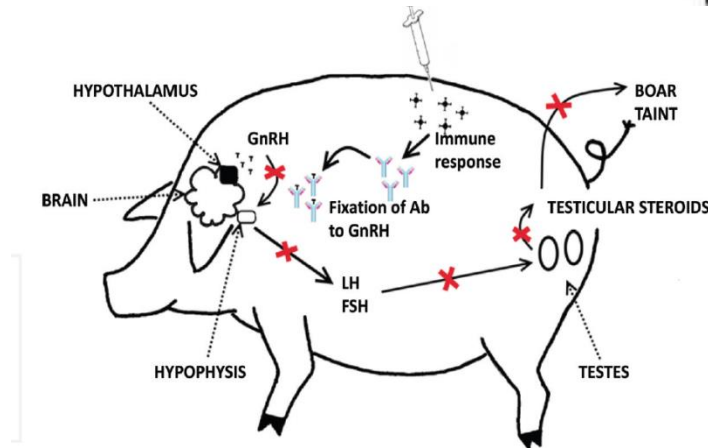
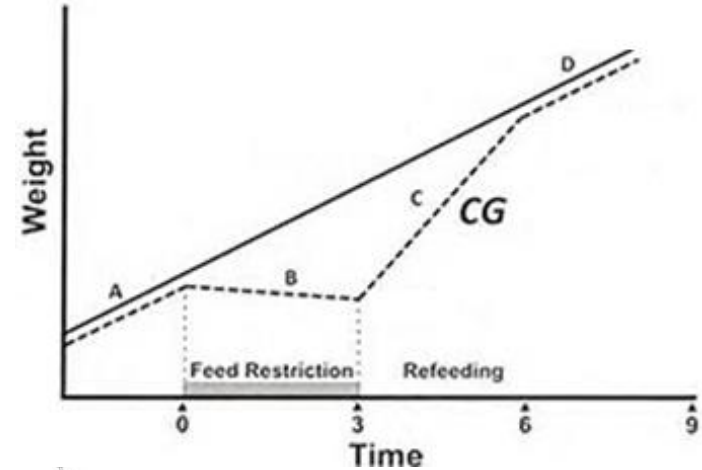


## b) Innovative practices

- Effects on productive traits, product quality and animal welfare

- I. Compensatory growth in Cinta Senese
- II. Zootechnical evaluation of Ribatejano (Alentejano × Bísaro)
- III. Immunocastration (IC)


- ✓ in Iberíco (protocol adapted to *montanera* system)
- ✓ Performances - Iberíco
- ✓ Performances - Mangulica




## b) Innovative practices

I. Compensatory growth in Cinta Senese

II. Zootechnical evaluation of Ribatejano (Alentejano × Bísaro)

Objective	Breed	 Highlights on first available results
I. Compensatory growth	Cinta Senese	<ul style="list-style-type: none"><li>protein-restricted-pigs showed higher slaughter weight &amp; greater lipid deposition &amp; higher proportion of subcutaneous (inner layer) backfat.</li></ul>
2. Zootechnical performance of Ribatejano crossing Alentejano × Bísaro (AL × BI) Bísaro × Alentejano (BI × AL)	Crossing Ribatejano	<ul style="list-style-type: none"><li>Birth weight - <math>AL \times BI &gt; BI \times AL</math>.</li><li>Colostrum intake, mortality rate during lactation and weight at 28 days were similar in both crosses</li><li>in the first growth period (30-65 kg) - AL pigs had a lower ADG than BI pigs and both crosses (which were similar)</li><li>in the second growing and fattening period (65-150 kg) ADG was similar in all genotypes</li></ul>

## b) Innovative practices - immunocastration

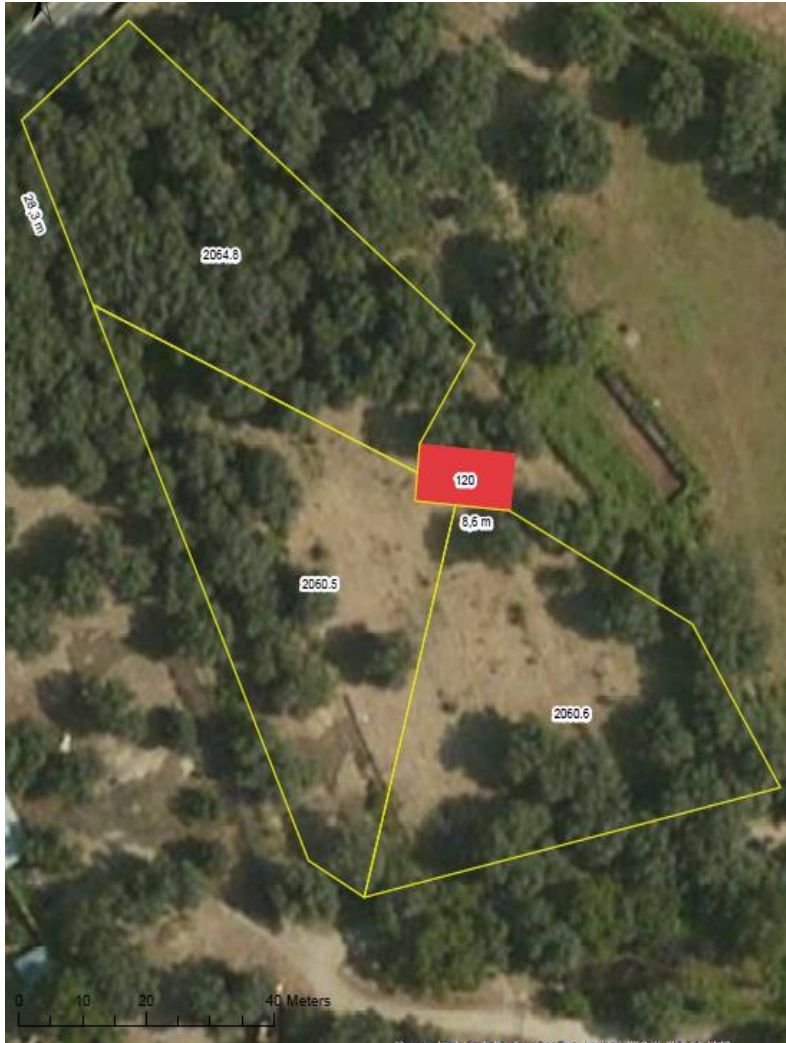
Objective	Breed	 <b>Highlights on first available results</b>
3. Immunocastration — efficacy of adapted vaccination protocol to “montanera”	Iberico	<ul style="list-style-type: none"> <li>• short-time (15 days) ad libitum feeding before “montanera” increased the efficacy of IC to 100% as shown by deeper and more uniform testicular atrophy, and no androstenone</li> <li>• testicular parenchyme colour (CIE a) was highly correlated (<math>r=0.87</math>) with testicular weight</li> </ul>
4. Immunocastration — effect on performance	Iberico	<ul style="list-style-type: none"> <li>• 12 % higher daily gain (40-100 kg) and feed efficiency (10%) in IC than SC males</li> <li>• IC males showed higher proportion of lean cuts (loin, sirloin, butt lean) and carcass length than SC males</li> </ul>
5. Immunocastration — effect on performance	Mangulica	<ul style="list-style-type: none"> <li>• no differences in overall growth rate between IC and SC, nevertheless growth rate was higher in IC than SC after V2</li> </ul>

## *c) Housing – rearing system*

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- Effects on productive traits, product quality and animal welfare
  - I. Ecological and conventional system - Krškopolje
  - II. Indoor vs. outdoor – Schwäbisch-Hälisches
  - III. Indoor vs. outdoor – Crna slavonska
  - IV. Development of body composition in indoor system – Crna slavonska
  - V. Alternative housing system – development of hoop barn - Bísara


# Hoopbarn development – PT trial



# c) Housing – rearing system



- Effects on productive traits, product quality and animal welfare

Objective	Breed	 <b>Highlights on first available results</b>
1. Comparison of performances in ecological and conventional system (from 70 kg onwards)	Krškopolje	<ul style="list-style-type: none"> <li>• in equivalent dietary conditions, pigs reared according to ecological standards exhibited 10% higher daily gain;</li> <li>• fat tissue deposition intensifies in Krškopolje pigs at 70-80 kg live weight;</li> <li>• ultimate pH lower (muscle energy reserves higher) in pigs reared according to organic production rules;</li> <li>• pigs in ecological rearing system showed different myosine heavy chain expression.</li> </ul>
2. Performances in indoor and outdoor system	Schwäbisch-Hällisches	<ul style="list-style-type: none"> <li>• in equivalent dietary conditions, pigs reared outdoor were slightly more uniform regarding carcass traits (eg lean meat content) than indoor reared pigs</li> </ul>
3. Alternative housing system, performances and welfare	Bísaro	<ul style="list-style-type: none"> <li>• Alternative housing with hoop barn (and outdoor access area) was developed</li> <li>• Similar growth performance was observed in hoop barn and standard confinement rearing system (but welfare improvement)</li> </ul>
3.A Performances in indoor and outdoor system; 3.B Development of body composition in pigs kept in indoor system	Black Slavonian	<ul style="list-style-type: none"> <li>• pigs kept indoors exhibited increased fatty tissue growth;</li> <li>• outdoor raised pigs had low daily gains of live weight and fat. Muscle tissue seems to persist in growth even in the late stages, although at low rate.</li> </ul>



# d) Feeding resources







- Effects on performances and product quality



# d) Feeding resources

- Effects on performances and product quality



Feeding resource	Breed	Highlight on first available results
Lucerne hay 	Krškopolje	<ul style="list-style-type: none"> <li>• fat tissue of pigs supplemented with lucerne hay had more vitamin A and n-3, n-6 polyunsaturated fatty acids</li> </ul>
Root crops 	Krškopolje	<ul style="list-style-type: none"> <li>• feeding with root crops and cereals showed strongly reduced growth rate compared to pigs fed concentrates</li> <li>• more intense m. longissimus colour (lower CIE L, higher CIE a)</li> </ul>
Acorns 	Schwäbisch-Hällisches	<ul style="list-style-type: none"> <li>• 20% replacement of standard diet with acorns had no effect on carcass characteristics;</li> <li>• data on meat quality and growth is in progress</li> </ul>
Acorns 	Turopolje	<ul style="list-style-type: none"> <li>• 30% replacement of standard diet with acorns had no effect on fatty acids of backfat, but increased content of saturated fatty acid in intramuscular fat</li> <li>• strong effect was noted on gut microbiota</li> </ul>
Tannin wood extract 	Mangalitsa	<ul style="list-style-type: none"> <li>• 2% diet supplementation with tannin rich wood extract resulted in 12% decrease in growth rate</li> <li>• analyses of meat quality are in progress;</li> </ul>
Olive by-product "alperujo" 	Iberian	<ul style="list-style-type: none"> <li>• The use of olive by-products (in dry or wet presentation) during growing period as a substantial component of the diet did not affect the commercial slaughter weight nor carcass composition after fattening "montanera" period (acorn and grass). Results are similar to traditional restricted feeding system.</li> </ul>




poster

presentation later



# Feeding resources

- Effects on performances and product quality

Feeding resource	Breed	 <b>Highlight on first available results</b>
Rice husk 	Iberian	<ul style="list-style-type: none"> <li>• three groups varying in level of fibers were tested in “premontanera” phase (10-14 months of age), without any diarrheic problems;</li> <li>• ADG until the end of “premontanera” was greater for High fiber group, which also exhibited steadier (in time) and more homogeneous (among animals) growth rate.</li> </ul>
Potatoes Germinated seeds 	Bísaro	<ul style="list-style-type: none"> <li>• No results are available yet; analyses of meat quality are in progress</li> </ul>
Season: spring/winter (availability of feedstuffs)	Gascon	<ul style="list-style-type: none"> <li>• no effect of season on growth rate;</li> <li>• pigs slaughtered in winter had slightly fatter carcasses;</li> <li>• ultimate pH was lower in winter slaughtered pigs (higher muscle energy reserves);</li> <li>• IMF was not affected in loin but was higher in ham of pigs slaughtered in spring;</li> <li>• ratio of n-6/n-3 fatty acids was reduced in both subcutaneous and im fat of spring slaughtered pigs</li> <li>• analysis of pigs slaughtered in autumn is in progress</li> </ul>

# Conclusions

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- for many untapped local breeds these are the first results on their performances in a controlled experimental environment,
- growth potential of local breeds is often underestimated,
- protein deposition (their precocity index) is substantially lower than in modern breeds,
- for better understanding of nutritional (protein) requirements of local pig breeds
  - a) studies on Iberico and Cinta Senese,
  - b) modelling studies,
- innovative practices => to improve knowledge about the alternative solutions in production systems with local pig breeds,
- Investigations with locally available resources => exploitability and benefits for production systems with local pig breeds & impact on product quality.

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