

Nero Siciliano Pig

*Riccardo Bozzi, Maurizio Gallo, Claudia Geraci,
Luca Fontanesi and Nina Batorek-Lukač*

Abstract

Origins of Nero Siciliano pig date to Carthaginian domination and its rearing, after a setback during the Arab period, was rather diffused throughout Sicily. Breed rearing is nowadays limited from the farmed area to the wooded hills of north-eastern Sicily. The latest available status (2015) reported 87 registered farms with about 1100 breeding sows and 124 boars enrolled in the herdbook started in 2001, as well as the conservation programme. Coat colour is mainly black but white face and wattles are accepted. Nero Siciliano pigs have on average 7.6 piglets of 1.4 kg live body weight and the average daily gain during fattening period was on average 346 g/day for the overall fattening stage. Slaughter age of Nero Siciliano breed was on average 390 days, at an average live weight of 95 kg. Average intramuscular fat content was 4.6% and as regards fatty acid composition, average values obtained for SFA, MUFA and PUFA were 37.5, 54.2 and 8.3% in *longissimus* muscle and 39.0, 49.4 and 11.7% in back fat tissue, respectively. This review gives an exhaustive review of the information available for this local Italian breed.

Keywords: traditional European breed, TREASURE, productive traits, phenotype, Italy

1. History and current status of the breed (census)

The Nero Siciliano is a breed of domestic pig from the Mediterranean island of Sicily, in southern Italy [1]. The breeding of this pig has ancient origins: fossil remains and written documents testify the presence of these animals since the period of Greek and Carthaginian domination (VII-VI century). The pig breeding suffered a setback in the ninth century under Arab domination, while it recovered with the Norman conquest. Numerous breeds and pig populations deriving from the Neapolitan black-haired breed have helped to form this breed that nowadays presents well-defined characteristics [2]. From the early twentieth century, the Nero Siciliano was usually raised in small groups of 10–15 animals and the crossing with other improved breeds was rather diffused. It was not rare at that time to observe white spotted or totally white animals [2]. The breeding of this pig population was widespread on the island until the middle of the twentieth century, and the Nero Siciliano assumed different names in the various geographical areas of breeding [2]. The subsequent socio-economic changes limited the farmed area to the wooded hills of north-eastern Sicily (Madonie and Nèbrodi). Presently, there are 87

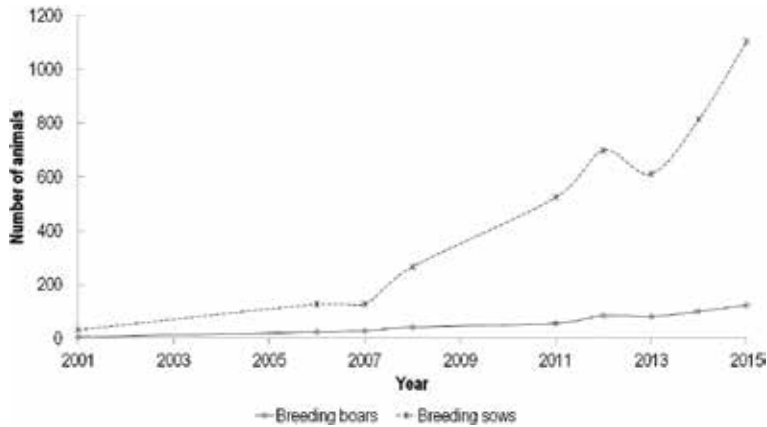


Figure 1. Census of Nero Siciliano pig breed, presenting number of sows and boars per year, starting with the year of herdbook establishment.

registered farms of Nero Siciliano pigs with about 1103 breeding sows and 124 boars in the latest available status (August 2015, [3]). Census of Nero Siciliano pig breed is presented in **Figure 1**.

2. Exterior phenotypic characteristics

The Nero Siciliano pig breed morphology information is summarised in **Table 1**. It is a medium-size breed with mainly black coat colour (**Figure 2**), robust with strong skeleton and black skin and bristles. Some subjects may have a partially or totally white face ('facciolo' pig). Head of remarkable development and long, straight profile, narrow and inclined snout; small ears obliquely directed at the top with tips brought horizontally forward. The presence of wattles is tolerated, even if not typical of the breed. Elongated neck and poorly developed trunk, compressed in the thoracic region.

| Measurement (average) | Adult male | Adult female |
|-------------------------------|------------|--------------|
| Body weight (kg) | 150 | 130 |
| Body length ¹ (cm) | 102 | 87 |
| Ear length | Small | Small |
| Chest girth (cm) | 127 | 115 |
| Height at withers (cm) | 60–65 | 60–65 |
| Number of teat (average) | 11.4 | 11.4 |

¹Measured from the tip of the nose to the starting point of the tail.

Table 1. Summary of morphology information on Nero Siciliano pig breed.

3. Geographical location and production system

Nero Siciliano is raised mainly in the province of Messina, particularly in the Monti Nebrodi. The particular orography of this area, characterised by narrow and parallel valleys that end on the coast, favours the natural segregation of the



Figure 2.
Nero Siciliano sow with piglets.

animals, with consequent conservation of an interesting genetic variability. Since 2001, the conservation programme involves a group of companies that adopt the traditional extensive breeding techniques which usually foreseen to let the pigs in forest, if present, during all the year. Depending on climatic conditions the period in the forest could be limited to autumn-winter or spring-summer seasons. The pig breeding has always been present in the farms of the region with the function of recovery and reuse of waste and for their ability to produce supplementary income. It is bred with a fully extensive system by reproducing itself in the bush without any particular precaution using the resources made available by the pastures and the forest. A study of Aronica et al. [4] showed that almost all the farmers (88%) are only responsible of the breeding, whereas other professionals are in charge of processing and selling products.

4. Organisations for breeding, monitoring and conservation

The Italian Pig Breeders Association (ANAS) is the organisation responsible for monitoring the breed, which is not interested by a selection scheme and the exclusion of the animals from the herdbook is based only on morphological characteristics. Indeed, the activity is aimed at the conservation of the breed with particular regard to the maintenance of genetic variability. In 2003, a private association was

| Name of organisation | Address | Web and e-mail address |
|--|---|--|
| Associazione Nazionale Allevatori Suini (ANAS) | Via Lazzaro Spallanzani 4, 00161 Rome, Italy | www.anas.it |
| Consorzio di tutela 'Suino Nero dei Nebrodi' | C/da Forte, 10-98069 Sinagra (ME), Italy | consorzionerosicilia@tiscali.it |

Table 2.
Contact details of breeding organisations for Nero Siciliano pig breed.

established (Consorzio di Tutela Suino Nero dei Nebrodi) promoted by the Regional Breeders Association of Sicily in the province of Messina, within the Natural Park of Nebrodi. The activity of the Consortium is aimed at the protection and diffusion of the Nero Siciliano pig through the recognition of PDO that allows the enhancement of its meat and derived products (**Table 2**).

5. Productive performance

5.1 Reproductive traits

Basic data obtained on reproductive traits in this review are presented in **Table 3**. According to survey performed within TREASURE project, the age of sows at first parturition is 30 months [9], whereas age at culling is 47 months [1]. The only information reporting these traits does not allow making highly reliable inferences but, nevertheless, the relatively low age at culling could be due to the presence both of sows culled after the first event and of sows at the end of their productive life. It is actually quite frequent that the farmer tests the females keeping only some of them for reproductive career. Sows of Nero Siciliano pig breed have 1.1 litters per year [5] with 6.2–9.0 piglets [3, 5, 7, 11] of approximately 1.4 kg live body weight [7, 9, 10]. Stillborn percentage of piglets (0.4 and 4.8%; [3, 7]) and piglet mortality rate until weaning (1.3 and 8.9%; [3, 7]) are relatively low in the considered studies. As in most of extensive systems of rearing, farrowing interval is prolonged, in comparison to modern intensive systems to 332 days [5].

5.2 Growth performance

Basic data on growth performance obtained in this review are presented in **Tables 4** and **5**. Due to big differences between studies with regard to the live weight range covered, we defined the stages for growth performance as early and middle fattening stages estimated between approximately 30 and 60 kg, 60 and 100 kg live body weight, respectively. No studies on late fattening period were found even if, sometimes, the source provided the overall growth rate for the whole fattening stage (defined as overall). It should also be noted that most of the

| References | Sow age at first parturition (mth) | Litters per sow per year | No. of piglets alive per litter | Piglet live weight (kg) | Stillborn per litter (%) | Mortality at weaning (%) | Farrowing interval (d) | Sow age at culling (mth) |
|------------|------------------------------------|--------------------------|---------------------------------|-------------------------|--------------------------|--------------------------|------------------------|--------------------------|
| [3] | – | – | 7.8 | – | 0.4 | 8.9 | – | 47 |
| [5] | – | 1.1 | 7.3 | – | – | – | 332 | – |
| [6] | – | – | – | – | – | – | – | – |
| [7] | – | – | 6.2 | 1.4 | 4.9 | 1.3 | – | – |
| [8] | – | – | – | – | – | – | – | – |
| [9] | 30 | – | – | 1.5 | – | – | – | – |
| [10] | – | – | – | 1.5 | – | – | – | – |
| [11] | – | – | 9.0 | – | – | – | – | – |

No. = number, mth = month, BW = body weight, d = days.

Table 3. Summary of collected literature data on traits of reproduction in Nero Siciliano pig breed.

| References | Feeding | No. of animals | ADG fattening ¹ | | | ADG birth-slaughter |
|------------|---------|----------------|----------------------------|--------|---------|---------------------|
| | | | Early | Middle | Overall | |
| [1] | – | – | – | – | 600 | – |
| [10] | – | 31 | – | – | 253 | – |
| | – | 9 | – | – | 191 | – |
| [11, 12] | – | – | – | – | – | 211 |
| [13] | – | 12 | – | 465 | 465 | – |
| | – | 12 | – | 346 | 346 | – |
| | Rest | 10 | – | – | 358 | – |
| | Rest | 10 | – | – | 393 | – |
| [14] | Rest | 20 | – | 264 | 264 | – |
| | Rest | 20 | – | 162 | 162 | – |
| [15, 16] | Rest | 15 | 328 | – | 328 | – |
| | Rest | 15 | 360 | – | 360 | – |
| [17] | Rest | 10 | – | – | 431 | – |
| | Ad Lib | 10 | – | – | 540 | – |
| [18, 19] | – | 37 | 241 | 333 | 287 | – |
| | Rest | 41 | – | – | 208 | – |

No. = number; ADG = average daily gain in g; Ad Lib = ad libitum feeding regime; Rest = restrictive feeding regime.
¹ADG in a period of fattening is reported for early and middle fattening stages estimated between approximately 30–60 kg and 60–100 kg, respectively. Sometimes, the source provided only the overall growth rate for the whole studied period (in that case defined as overall).

Table 4.
 Summary of collected literature data on growth performance in Nero Siciliano pig breed.

collected studies simulated practical conditions of the production systems used. Only the study of Liotta et al. [17] actually aimed at evaluating the breed potential for growth in *ad libitum* conditions of feeding, showing that maximal growth rate of Nero Siciliano pigs is 540 g/day in overall fattening stage (observed from 42 to 93 kg live weight; [17]). In the considered studies, data for average daily gain in lactation and growing period were not found, whereas reported average daily gains in early, middle and overall fattening stage were low and variable (241–360,

| References | Feeding | ME content of feed (MJ/kg) | CP content of feed (%) | No. of animals | ADFI fattening ¹ | |
|------------|---------|----------------------------|------------------------|----------------|-----------------------------|---------|
| | | | | | Middle | Overall |
| [14] | Rest | 12.8 | 15.19 | 20 | 1.5 | – |
| | Rest | 10.3 | 10.27 | 20 | 2.2 | – |
| [15] | Rest | 13.1 | 15.91 | 10 | – | 1.72 |
| | Ad Lib | 13.1 | 15.91 | 10 | – | 2.93 |

No. = number; ADFI = average daily feed intake in kg/day; Ad Lib = ad libitum feeding regime; Rest = restrictive feeding regime; ME = metabolisable energy, CP = crude protein.
¹ADFI in a period of fattening is reported for early fattening stage estimated between approximately 30 and 60 kg. Sometimes, the source provided only the overall daily feed intake for the whole fattening period (in that case defined as overall).

Table 5.
 Summary of collected literature data on average daily feed intake (in kg/day) in Nero Siciliano pig breed.

162–465 and 162–600 g/day in early, middle and overall fattening stage, respectively). Also, average daily gain in the period from birth to slaughter (at 18 months of age) observed for Nero Siciliano pig in QUBIC project was much lower compared to modern breeds of pigs (211 g/day; [11, 12]).

In considered studies, the information on feed intake and feed nutritional value were scarce, which limits the evaluation of growth potential. Average daily feed intake reported was 1.5–2.2 kg/day in middle fattening stage and 1.7–2.9 kg/day in overall fattening stage [14, 15]. Observing the average feed intakes registered in the different fattening periods and considering the low slaughter weights achieved, it could be argued that the feed transformation efficiency is quite low.

5.3 Body composition and carcass traits

Basic data obtained in this review for some of the most commonly encountered carcass traits that could be compared are presented in **Table 6**. In considered studies, the age at slaughter for Nero Siciliano breed ranges from 169 to 730 days of age [10, 15–20], with live weight ranges from 62 to 121 kg [10, 13–20]. These results actually indicating three different orientations of the farmers: one system with older animals and quite high slaughter weights, a second one producing small carcasses with middle age animals (approximately 1 year of age) and a last one devoted to produce light carcasses (60 kg). Dressing yield in considered studies was around 80% [1, 10, 13–20] and lean meat content varied from 39.7 to 59.0% ([13,

| References | No. of animals | Final age (d) | Final BW (kg) | Hot CW (kg) | Dressing yield (%) | Lean meat content (%) | Back fat thickness (mm) | | |
|------------|----------------|---------------|---------------|-------------|--------------------|-----------------------|-------------------------|------------|-------------|
| | | | | | | | S ¹ | At withers | At last rib |
| [1] | – | – | – | 105 | 80.0 | – | – | – | – |
| [10] | 31 | 380 | 96 | 78 | 81.1 | – | – | – | – |
| | 9 | 452 | 86 | 71 | 82.9 | – | – | – | – |
| [13] | 12 | – | 121 | 98 | 81.0 | – | – | – | 42 |
| | 12 | – | 110 | 88 | 80.5 | – | – | – | 34 |
| | 10 | – | 97 | 77 | 79.4 | 58.2 | – | – | 42 |
| | 10 | – | 102 | 82 | 80.8 | 59.0 | – | – | 49 |
| [14] | 20 | – | 110 | 89 | 80.6 | – | 40 | – | 34 |
| | 20 | – | 100 | 81 | 81.2 | – | 30 | – | 28 |
| [15, 16] | 15 | 169 | 62 | 45 | 72.9 | 48.7 | – | – | 17 |
| | 15 | 169 | 67 | 54 | 79.9 | 49.9 | – | – | 23 |
| [17] | 10 | 339 | 83 | 64 | 76.8 | 42.3 | 35 | – | 32 |
| | 10 | 339 | 93 | 74 | 79.1 | 39.7 | 49 | – | 39 |
| [18, 19] | 37 | 448 | 102 | 83 | 82.5 | – | 45 | – | 37 |
| | 41 | 487 | 88 | 82 | 81.9 | – | 39 | – | 33 |
| [20] | 15 | 730 | 107 | 89 | 82.9 | – | 46 | 52 | 47 |

No. = number; BW = body weight; CW = carcass weight.

¹S back fat thickness measured according to ZP method [above *Gluteus medius* muscle (mm)].

Table 6. Summary of collected literature data on body composition and carcass traits in Nero Siciliano pig breed.

| References | No. of animals | pH 45 | pH 24 | CIE ¹ | | IMF (%) | IMF fatty acid composition ² (%) | | | BFT fatty acid composition ³ (%) | | | | | |
|------------|----------------|-------|-------|------------------|------|---------|---|-------|-------|---|-------|------|------|------|-------|
| | | | | L* | a* | | b* | SFA | MUFA | PUFA | n6/n3 | SEA | MUFA | PUFA | n6/n3 |
| [10] | 31 | 6.07 | 5.51 | 52 | - | - | - | - | - | - | - | - | - | - | - |
| | 9 | - | - | 49 | - | - | - | - | - | - | - | - | - | - | - |
| [13] | 12 | 6.12 | - | 49 | 10.6 | 10.1 | 3.7 | 39.66 | 48.9 | 11.44 | 3.4 | - | - | - | - |
| | 12 | 6.28 | - | 46 | 10.1 | 11.4 | 3.0 | 34.04 | 59.93 | 6.03 | 13.0 | - | - | - | - |
| | 10 | 6.38 | - | - | - | - | 10.0 | - | - | - | - | - | - | - | - |
| | 10 | 6.14 | - | - | - | - | 5.7 | - | - | - | - | - | - | - | - |
| [14] | 20 | 6.28 | 5.65 | 46 | 11.0 | 12.4 | 5.6 | 35.7 | 58.9 | 5.44 | 37.8 | - | - | - | - |
| | 20 | 6.38 | 5.64 | 47 | 11.4 | 13.4 | 4.6 | 35.6 | 58.6 | 5.79 | 33.1 | - | - | - | - |
| [15,16] | 15 | 6.37 | 5.65 | 61 | - | - | 2.7 | 38.6 | 49.3 | 12.1 | 7.5 | 40.9 | 49.1 | 10.0 | 9.7 |
| | 15 | 6.34 | 5.56 | 61 | . | . | 3.1 | 41.4 | 49.5 | 9.1 | 10.8 | 41.0 | 47.6 | 11.4 | 13.8 |
| [18,19] | 37 | 6.29 | - | 47 | 15.3 | 4.9 | 3.3 | - | - | - | - | 38.3 | 47.4 | 14.5 | 18.3 |
| | 41 | 6.18 | - | 50 | 14.7 | 5.8 | 4.3 | - | - | - | - | 35.8 | 53.3 | 10.9 | 10.7 |
| [20] | 15 | 6.06 | 5.45 | 51 | 15.7 | 4.6 | - | - | - | - | - | - | - | - | - |

No. = number; pH 45 = pH measured approximately 45 min post-mortem; pH 24 = pH measured approximately 24 h post-mortem; IMF = intramuscular fat; SFA = saturated fatty acids; MUFA = monounsaturated fatty acids; PUFA = polyunsaturated fatty acids.

¹CIE = objective colour defined by the Commission Internationale de l'Eclairage; L* greater value indicates a lighter colour; a* greater value indicates a redder colour; b* greater value indicates a more yellow colour.

²For fatty acid composition of intramuscular fat tissue in longissimus muscle, only pigs on control diet were considered, and when fatty acid composition was reported separately for neutral and polar lipids, values reported for neutral lipids were considered. Control diets differed among studies, to see diet composition address to the corresponding source.

³For fatty acid composition of back fat tissue, only pigs on control diet were considered and when fatty acid composition was reported separately for outer and inner layers, values reported for outer layer of back fat tissue were considered. Control diets differed among studies, to see diet composition address to the corresponding source.

Table 7.
 Summary of collected literature data on meat quality in Nero Siciliano pig breed.

15–17]; SEUROP classification). The back fat thickness value measured on the withers was 52 mm [20], from 17 to 49 mm at the level of last rib [13–20] and from 30 to 49 mm above *gluteus medius* muscle [14, 17–20]. No data providing measurements of muscularity were found in considered studies.

5.4 Meat quality

Basic data obtained in this review with some of the most commonly encountered meat and fat quality traits measured in *longissimus* muscle that could be compared are presented in **Table 7**. In the studies reporting meat quality of Nero Siciliano pigs, pH measured in *longissimus* muscle at 45 min and 24 h *post-mortem* was on average 6.24 [10, 13–16, 18–20] and 5.58 [10, 14–16, 20], respectively. Intramuscular fat content in the considered studies ranged from 2.7 to 10.0% [13–16, 18, 19], increasing with slaughter weight. Colour measured in CIE L, a, b colour space was very variable (46–61, 10.1–15.7 and 4.6–13.4 for L, a* and b*, respectively). SFA, MUFA and PUFA content of intramuscular fat in *longissimus* muscle were approximately 37.5, 54.2 and 8.3% [13–16], whereas SFA, MUFA and PUFA content of back fat tissue in the considered studies were around 39.0, 49.4 and 11.7% [15, 16, 18, 19], respectively.

6. Use of breed and main products

The Nero Siciliano breed is raised with a full extensive system. Animals are raised in wide areas of Nebrodi Natural Park (woods of beech and oak trees) limited by fences, exploiting the natural pastures used for grazing: food integration is provided only during the gestation period. In few cases, close to the slaughter weight, the animals are captured and submitted to a finishing phase with a diet based on cereals. Breeders have very small companies and, in most cases, they are also transformers. Their products are intended for family consumption or subject to small local exchanges as well as to local and national markets. The meat of Nero Siciliano is extremely sapid, ruby red coloured, suitable for typical products such as the salami of ‘S. Angelo’, the Troinese sausage, the Nebrodi bacon and the Nicosia ham. The Sant’Angelo salami obtained the PGI since 2008 even if Nero Siciliano could be employed in this production only with cross-bred animals.

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Author details

Riccardo Bozzi^{1*}, Maurizio Gallo², Claudia Geraci³, Luca Fontanesi³
and Nina Batorek-Lukač⁴

1 DAGRI–Animal Science Section, University of Florence, Florence, Italy


2 ANAS–Italian Pig Breeders Association, Rome, Italy

3 Department of Agriculture and Food Sciences, University of Bologna, Bologna, Italy

4 KIS-Agricultural Institute of Slovenia, Ljubljana, Slovenia

*Address all correspondence to: riccardo.bozzi@unifi.it

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