The Marchigiana: a breed to be exported
The initiative has been realized with the financial support of the European Regional Development Fund in the framework of Adriatic New Neighbourhood Programme Interreg IIIA Adriatic Crossborder.
Marchigiana cattle breed has been for many decades “engine” of the rural economy and income source for many families, communities and businesses that have used the working performances of this strong and mild cow. In this direction, Marchigiana cattle breed recalls rural traditions, the laboriousness of Marche’s people, sharecropping and conditions that have brought to development of Marche’s society during the last century.

If it is true that the identity of a community, of a region, passes through common historical-cultural denominators, for Marche’s people one of these – and within the most evident – is surely represented by Marchigiana cattle breed.

It is not by coincidence that this breed is called Marchigiana; it is a race that has been selected since the end of the 19th century by breeders of our region to work on the clayey grounds and to sustain their families.

To be a breeder of marchigiana “bulls” would give – then as today – social prestige; in visiting a farmhouse the first thing that would be shown, before entering the house, would be the stable. It was in the stable that during the winter people would gather to warm up and, while the cattle lying down would softly ruminate, play and tell stories.

It is a frugal, mild, but more than anything else strong and resistant, with high maternal attitudes; the character of Marche’s man, solid, thoughtful and of few wise words, seems toughened by the relation held through centuries with this animal.

Today the social and economic conditions are different; Marchigiana cattle race bred in the last years is the result of an efficient selection that has produced a race specialized to obtain a meat of optimal quality.

In Marche Region there are more than 20,000 cows in selection, listed in the Herd Book; the breeders have substituted the stables for breeding in fixed stands with breeding structures in boxes and wild and semi-wild systems. To breed “Marchigiana” in wild or semi-wild state contributes to safeguard and enhance our mountainous and hilly landscapes, helps to keep alive traditions linked to the countryside, with positive results also on rural tourism; it means, mainly, to bet on an entrepreneurial activity that produces income and occupation for many rural companies often family run.
To talk today about Marchigiana means to talk about a “Marche” model that is synonym of good food, good meat quality, environmental protection, hygiene and animal wellness, food safety, and in any case of wellbeing and people’s quality of life.

The Marchigiana can therefore be considered a crowning achievement of Italian zootechny, a model to export, to favour sustainable development and of quality in marginal areas and, contemporarily, a true instrument of cooperation between the two Adriatic seashores. This work therefore summarizes the activities of Marcbal project but, at the same time, wants to be a kind of compendium, addressed to a wide audience, of technical-scientific knowledge useful to understand the characteristics of Marchigiana breed and the advantages connected to its breeding.

A fair thank you is addressed to all the partners of the project that have believed in the potentials of the race and have permitted the foundation of new knowledge nets between the cross border Adriatic regions.

The Vice President and Agriculture Councillor
Paolo Petrini
Cross border cooperation in Eastern Adriatic Countries and MARCBAL

*project by SVIM*

To sustain the preparations for a future integration of the Western Balkans in the European structures looking towards the final target of joining the Union is a priority theme for the EU. Currently, the integration process within European countries and the European Union’s widening needs an important institutional support by the cross border cooperation activities in order to favour the economic and social cohesion, as underlined by the rulings that discipline the European programme 2007 – 2013, and more than ever is also needed an integration of political nature. For this reason, many progresses have been made also with the support of cross border cooperation: the Eastern Adriatic Countries are constantly more aware about the complementarity of cross border cooperation with the process of European integration; the participation to community programmes may, in fact, contribute considerably to the integration of the western Balkan countries in the EU, promoting the exchange of competences and best practices, involving the interested parties in common activities and incentivizing the development of cross border investments.
In order to obtain this, the reorganization of the external assistance proposed by the Commission for the period 2007 – 2013 foresees an easing of the of the total of thematic and geographic instruments used up till now: within these new instruments there is the pre-adhesion instrument IPA (Instrument for Pre – Accession Assistance) addressed to the candidate countries (Turkey and Croatia) and the potential candidate countries (Albania, Bosnia Herzegovina, Serbia, Montenegro and Former Yugoslav Republic of Macedonia) replacing the previous programmes addressed to these areas (Phare, Ispa, Cards and Sapard) and covering the sectors as institutional reinforcement, regional and cross border cooperation, rural and human resources development. The candidate countries will receive more assistance to allow them to reach the criteria of adhesion, to adopt and out carry the acquis communitautaire and to be prepared to manage structural funds, for cohesion and rural development.

At the same time, on the basis of a widespread will to ensure participation to a wider initiative, largely intended as an instrument of cooperation and integration of the Balkan countries in the European Space, the Euro Adriatic Region has been established with the aim of strengthening a solid collaboration within regional and local entities and to contribute to solve or improve many matters that are related to the common resource “Adriatic sea”.

The target of defining key and common sectors to the Adriatic area, and therefore to build thematic permanent working commissions, is also to promote sustainable development and social and economic cohesion, reinforcing stability and the peace process going on in the Balkan area. Region Marche, is an active partner since the beginning within the works of the Euroregion, has evaluated as strategic policy the promotion and out carrying the principles of the Adriatic Euroregion in its territory, identifying in the cross border cooperation action an important opportunity also for the start up of equal and sustainable processes.

In this context, developing knowledge nets between the two Adriatic coastlines to modernize the primary productive structure and to innovate services and offered technologies represents an innovative challenge, specially facing the differences that today are present in the real and perceived quality of productions of the two areas and also bearing in mind the difficulties represented by the strong differences within the economic, administrative and legal systems of the Italian Adriatic Regions (IAR) and the Eastern Adriatic Countries (EAC).

The promotion of sustainable development in rural areas, reinforcing the public and private assistance and service structures addressed to the primary sector represent the basis on which Marcbal project is founded promoted by the Dept. Unit Zootechny and Fishery of Marche Region in the context of the New Adriatic Neighbourhood Programme INTERREG/CARDS/PHARE.

The creation of collaboration net within different stakeholders interested in the development of the territory have permitted to consider and outline a common field of collaboration, by developing at a regional level the adequate technical assistance and organizing activities that have promoted cross border collaboration.

The project, through the involvement of private and public bodies, has stimulated the spreading of
new techniques of company management, new products, production technologies and new cultivation methods in enterprises active in agriculture, through the development of quality systems in the bovine meat sector.

Through know how transfer between partners of the two Adriatic seashores, Region Marche has given a strong contribution to the future constitution of a governance system of quality zootechny for Marchigiana cattle breed in the Western Balkans (registry, genetic, research and veterinary) through spreading of best practices in marchigiana meat cattle breeding and methodologies of development of agricultural zootechnic productions.

Region Marche, through the technical assistance and the general project coordination by SVIM – Sviluppo Marche Spa, has out carried a multidisciplinary partnership that involves public bodies and educational structures in the sector of intervention, made by six Italian partners belonging to three Adriatic Regions (Marche, Abruzzo and Friuli Venezia Giulia) and two western Balkan partners (Albania and Bosnia Herzegovina).

The challenge in the next years will be to intensify the cooperation through common interventions and accompanying measures that, enhancing the Adriatic territory, will promote stability, security and prosperity contributing to the integration process of the Balkans in the European context.
INDEX

1 - THE EUROPEAN UNION POLICY ON AGRO-FOOD PRODUCTS ............................... pag. 15

1.1 The meat sector on the communitarian plan
1.1.1 Bovine meat in the European Union
1.2 The protection of the Geographic Indication at communitarian level
1.3 Certification of agro-food products coming from Third Countries
1.4 The creation of an international system to protect the geographic indication
1.5 The objectives of the certification brands
1.6 The European brand of the Protected Geographic Indication

2 - THE MEAT SECTOR IN ITALY ................................................................. pag. 21

2.1 “White Bullock of the Central Apennines - PGI”
2.2 Consortium for the Protection of the “White Bullock of the Central Apennines - PGI”
3 - THE MEAT SECTOR IN THE WESTERN BALKANS ........................................ pag. 25

3.1 The meat sector in Bosnia Herzegovina
3.1.1 Laws and bovine registration systems in Bosnia Herzegovina
3.2 The meat sector in Albania
3.2.1 Laws and bovine registration systems in Albania

4 - THE MARCHIGIANA BREED: THE HISTORY ........................................ pag. 30

4.1 From its origins to the Congress of Fermo: the Marchigiana breed: the métayage and the territory.
4.2 The solidity of Italian breeding: the evolution from the postwar period up to the present-day.
4.3 Topicality: the breed standard

5 - THE DIFFUSION: THE MARCHIGIANA IN THE WORLD ....................... pag. 45

5.1 Possible techniques for the diffusion of the Marchigiana breed
5.2 Advantages and disadvantages of the A.I and the embryo transfer
5.3 Diffusion in the Western Balkans: the Activities of the Marcbal project in Bosnia Herzegovina
5.4 Financed intervention programmes for the promotion and the diffusion of the breed in the
Western Balkans

6 - THE SELECTION AND THE GENETIC IMPROVEMENT OF THE BREED .... pag. 52

6.1 The objectives
6.2 The tools
6.3 The prospects

7 - THE BREEDING AND THE FEEDING ....................................................... pag. 61

7.1 The breeding systems
7.2 The mountain area
7.2.1 Difficulties and intervention priorities
7.2.2 The case study of Macereto
7.3 The high-middle hills
7.3.1 Difficulties and intervention priorities
7.3.2 Trial on the farm “Putido” in the Commune of Fabriano
7.4 The low hill area and the plain
7.4.1 Difficulties and intervention priorities
7.4.2 Testing on the forage used for intensive breeding
7.5 Conclusive considerations
8 - THE MARCHIGIANA BREED: MEAT PRODUCTION................................ pag. 86

8.1 Quality of the carcass and related classification
8.2 Meat Quality
8.2.1 Sanitary quality
8.2.2 Technological quality
8.2.3 Chemical-nutritional quality

9 - EVALUATION OF THE CHEMICAL-NUTRITIONAL CHARACTERISTICS IN BOVINE
MEAT SAMPLES OF THE MARCHIGIANA BREED WITH THE PGI BRAND.................. pag. 93

9.1.1 Analysis of the achieved results
9.1.2 Comparison between samples of meat with a PGI brand of the Abruzzo Region, the
Marche Region and of commercial origin
9.1.3 Substances with for important anti-oxidising activity

10 - SERVICES FOR BREEDERS AND ASSOCIATIONS.......................... pag. 102

10.1 Services for breeders
10.2 The associationist structure and the services offered
10.3 Exhibitions and Conventions
10.4 ISO 9001:2000 Certification
10.5 The electronic certification of meat

11 CONCLUSIONS................................................................. pag. 107

Notes of thanks................................................................. pag. 109
The European Union policy on food, for food produced in Europe as well as that imported from Third Countries, is based on two fundamental concepts:

- The tendency to protect and to promote the use of food brands. The DOC, PDO, PGI and GTS must be the target products for the diffusion of positive characteristics of traditional production;
- guarantee sanitary security in productions. The non noxiousness of food is a pre-requisite of any production, and more so, in the case of protected products, in absence of which brand policy will not be possible.

In order to guarantee food safety requisites, a series of pre-requisites must be set as basis for the health policy:

- all the supply chain subjects must be jointly interested. In fact, there should be an increase of associations, cooperatives of food producers and processors, as well as new agro-food integrated companies;
- knowledge regarding the characteristics of European agro-food products must be diffused, given attention and their specificity must be protected;
• consumers’ expectations, especially as regards sanitary characteristics, must be completely satisfied;
• the health conditions of bred animals must be constantly improved.
For the pursuance of these objectives, it is necessary to obtain the quality certification, an acknowledgement issued by the European Union, upon the proposal of the Ministry of Agricultural and Forestal Policies (MiPAF), which assigns third organisms to check that certified product conforms with the pre-set production regulation and, therefore, with determinant qualitative standards.

In particular, as from 1992, the European Community has adopted a juridical framework regarding the protection of the geographic indication and the denominations of origin of agro-food products – PDO and PGI with the EC Regulation 2081/92 – and the Guaranteed Traditional Speciality (TSG) with the EC Regulation 2082/92.

In this way, the valuable products of the quality certification can penetrate new markets, overcome consumers’ scepticism and be more appreciated. Unfortunately, certification systems are costly and even though on the one hand they guarantee the value and goodness of the product, on the other hand they make the product less competitive worldwide. Moreover, animal supply chains are extremely diversified on the types of animals bred and, therefore, they are very complex since there are many factors that contribute to the wholesomeness of the end product: feeding, breeding modalities, pathological events, transport, etc..

Nevertheless, the original legislative framework has, throughout recent years, proven to be little suitable to react to a series of changes that occurred in Europe and at a global level.

Indeed, the legislative changes, the enlargement of ten new Countries and, in particular, the contentious requests introduced by the World Trade Organisation (WTO) by third Countries (especially, Australia and United States), as well as technical problems in the putting into effect of two regulations, have shown that the law in force must be changed.

Upon acknowledging this necessity, the EU Council of Ministries has, on 20th March, enacted the adoption of EC Regulations 510/2006 (appendix 1) and 509/2006, to replace EC Regulations 2081/92 and 2082/92, respectively.

1.1 The meat sector on the communitarian plan

The meat sector is one of the most important sections of agriculture. Meat production in the European Union amounts to 16% of the global production.

The European Union owns a wide and heterogeneous zootechnical heritage that is subject to valorisation through the improvement of supply chains with quality and the certification of every production phase.

In Countries such as Ireland, Belgium, France, Germany and the Netherlands, breeding is important for the agriculture gross domestic production, while in regions such as Finland, Sweden and the mountainous areas of Italy and Austria, zootechnics has a vital role since it is the only source of possible income.
Communitarian policies aim at encouraging quality production by supplying an offer that takes into consideration also consumers and breeders’ requests and the protection of the environment. The agro-food market is prepared for competition and the marketing regulations are the main tools ensuring that producers base their production on quality, safety and information so as to safeguard the environment. The main objectives of these regulations are the attunement and facilitation of exchanges with the EU as well as with third Countries, to guarantee European consumers’ provisioning. From this perspective, the classification of the carcass and the labelling and traceability systems have proven to be essential tools to bring about effective improvement in meat quality, guaranteeing control on every supply chain phase, from the breeding to the consumption and satisfying consumers’ requests for information.

As regards the producer, laws make the acceptance of the term “meat” more rigorous. Laws have made it possible to increase the added value of products through the creation of “quality brands” that diversify productions, protecting them from abuse and imitation.

Environment safeguarding in zootechnics areas, a priority objective for the Communitarian Agriculture Policy, is carried out through “conditioning” which subordinates aids and fundings according to environmental laws and the practices of extensive breeding. For example, in the case of breeding that needs closed premises for white but also bovine and ovine meat, measures dealing with waste disposal and its storage.

1.1.1 Bovine meat in the EU

Bovine meat stands at the second place among the complex agriculture productions of the EU and most of these products are directly and indirectly derived from the dairy herds while about one third are calves born from “nurse cows”. The average annual production of bovine meat is around 6.5 to 7 million tons, 13% of the overall production.

In European regions on the western border and in the mountain areas, where cereal cultivation is not possible, extensive breeding is used. In these areas, the cow-calf line breeding technique is adopted.

In the southern European regions, the widely cultivated cereals are the basis of the cattle feeding which are bred with intensive breeding systems: only 10% of the bovines are bred on a liquid based diet.

The breeding systems vary according to region also linked to different cookery traditions. Therefore, European consumers have a wide range of bovine meat selection.

The meat production has undergone a fall after the BSE and the role of the European Union was fundamental for the recovery of the sector, adopting measures that guarantee quality control on feed and the identification of animals for consumer protection.
1.2 The protection of the Geographic Indication at communitarian level

The new EC Reg. CE 510/2006 clarifies and simplifies the laws regarding the geographic indication (PGI) and the denomination of origin of the agriculture and food products (PDO), which up to 2006 was regulated by the EC Regulation no. 2081/92 of the Council.

The new regulation, in the communitarian area, makes the procedures for the acknowledgement of geographic indication less complicated by reducing the time for oppositions and with more coordination between national and communitarian institutions.

As for the control system, the insertion of provisions on this matter in the framework of the Regulation (EC) no. 882/2004, on official inspections to verify conformity to the laws on feed and food and the laws on animals' health and the wellbeing intends to strengthen the credibility of the system (refer to article 10).

Finally, another factor that strengthens the credibility of the geographic indication and the denomination of origin system is the obligation to insert the PDO and PGI inscriptions and the related communitarian symbols on the label. These provisions (article 8.2) have come into effect as from 1 May 2007.

1.3 Certification of agro-food products coming from Third Countries

14 years from the first introduction of laws in this sector, the European Union simplified and clarified the procedures for the registration of certified products. It also grants requests from the World Trade Organisation to balance out competition, so that third Countries are no longer obliged to have the reciprocity request and the equivalence of protection.

In fact, the main modifications effected were on the laws that regulate the procedure for the presentation of non-communitarian geographic indications.

In particular, third Country producers may directly present a registration form to the European Community, avoiding passing through national governments (article 5, paragraph 9.2 of Reg. 510/2006). Likewise with this modification the requisite for interested countries to have an equivalent geographic protection system (reciprocity principle) has been eliminated. Indeed, art 12.1 of EC Regulation 2081/92 specifically provides a series of conditions for equivalence and reciprocity applicable to third Countries which unless satisfied will nullify the application for the registration of a geographic indication.

The decision of the Controversy Resolution Organ of the WTO has been based on the conditions of reciprocity and equivalence found in article 12 onwards of EC Reg. 2081/92, after the claims presented by the United States and Australia. The WTO concluded that the EC Reg. 2081/92 is incompatible with article 3.1 of the Trips Agreement (section 3 of the latter is entirely dedicated to the protection of geographic indications, which are therefore acknowledged as rights with intellectual properties and with article III:4 of GATT of 1947 which prohibit member countries of the WTO to apply less favourable treatment, with respect to the national one, as regards the pro-
tection of intellectual property and important products which must be given the same “national treatment”.

The abrogation of article 12 onwards of the Reg. (EC) no. 2081/92, requesting the application of the reciprocity principal, guarantees equality of treatment for communitarian and third country products. Moreover, since with the new regulation the intervention of the government of third countries is no longer necessary when applying for the registration and for its opposing, and since, as regards control, it eliminates the factors that created a formal discriminatory treatment compared to EU countries, it is incompatible with art. III:4 of GATT.

In sum, by allowing producers of geographic indication of third countries to register their products in the European registry of Geographic Indications, without being submitted to the principle of reciprocity, the EU fully meets the rules of international marketing, strengthening its contractual position towards the WTO. Moreover, the law that establishes the inspection to be carried out to check that regulations are being respected for all the PGI on the market whether national, European or coming from third countries, guarantees greater consumers’ safety.

1.4 The creation of an international system to protect the geographic indication

The adoption of EC Reg. 510/06 is the opening of Europe at an international level and favours the promotion of geographic indications that are tools of intellectual property. Nevertheless, it is necessary that the protection acknowledge by Reg. (EC) (CE) 510/2006 (appendix 1) in the communitarian field will be extended to the markets of third Countries through an agreement within the WTO, so as to guarantee that the protection systems of geographic indications, which already exist in many third Countries, are perfectly in conformity with the laws of the WTO.

1.5 The objectives of the certification brands

It is important to highlight that, within the EC area, the certified products (with any certification), like any other food products introduced into the market, must respect the same production standards on health safety and wholesomeness, through the implementation of a programme that controls the entire production chain of the product.

In particular, the traceability systems activated for animal’s health and with the food industry, besides providing the safety requirements, have the purpose of documenting the history of the product throughout the entire productive chain, from the raw materials up to the end product to back the processes of quality assurance.

Certainly “certification” is, for the safety of the product, an added value even when considering the greater control exerted by authorities and protection consortia.
1.6 The European brand of the Protected Geographic Indication (P.G.I)

For the meat supply chain, the PGI does not only indicate the typical techniques of the product to the consumers, but also the origin, the breeding system and the cattle feeding, the origin of every animal, from birth to the butcher's counter or the selling point. In fact, once the acknowledgment is obtained, the denomination, at each producer's, must be submitted to:

- control conformity to the regulation on production, a task for which the third certification body is competent (which, in fact, also monitors the perfect sanitary product reliability) authorized by MiPAF;

- monitoring the marketing, a function assigned to the Consortia of Protection.

In particular, the Consortium of Protection, an organism that represents producers, carries out the activities necessary for the promotion and the valorisation of the product on the market. The duties of the certification activities are assigned to producers who, in this way, invest to improve their own expertise and, above all, to transmit to consumers a “substance” (not just an “image”) of seriousness and passion for their own work.

The PGI (Protected Geographic Indication) is a quality brand that is attributed to those agriculture and food products for which a certain quality, reputation or another character depends on the geographical origin and whose production, processing and/or elaboration is carried out in a certain geographic area.

Therefore, to obtain the PGI at least one phase of the productive process must take place in a particular area. The producers of PGI must conform to the rigid productive rule established by the disciplinary measures of production (appendix 1), and the respect of these rules is guaranteed by the controlling organism.
In Italy, the meat supply chain sector is fragmented and still very little integrated due to the limited medium size of the farms, the slaughterhouses and also those of product processing. According to a study of the structure and the dynamics of the production costs, conducted by the Observatory of the market of dairy products, the production of bovine meat in Italy is carried out with very varied breeding systems due to the different degree of company specialisation and the adopted productive techniques. The structure of the offer is characterised by the two breeding systems used in Italy, that of fattening calves and the closed cycle which is found mainly in the northern area of the peninsula, especially in the Veneto, Lombardia, Emilia-Romagna and Piemonte regions in virtue of the availability of vast surfaces for the production of forage cereal with high productivity and the facility to obtain by-products. Zootechny set-ups mainly use the Piemontese breed for closed cycle breeding while local breeds or stalled cattle, imported from France, are used for the open cycle typology.

In the areas of the Central Apennines or South Italy, extensive breeding of the traditional white
meat Italian breeds are used, with less productive quantities due to the scarce productivity of permanent forage, which valorises the territory minimizing the production costs in terms of labour costs per kg of meat. In addition, the presence of grazing lands implies less work intensity for nurse cow.

Therefore, if the Italian productive model is, on the one hand, oriented towards specialized fattening companies, on the other hand, are some small farms that have the role of environment protectors, exploiting communitarian economic aids, and providing a point of reference for the meat sector in Italy.

The s.w.o.t. analysis conducted by ISMEA (2005) has identified the following strengths within the Italian meat sector:

- strong economic importance, both in terms of production and employment; strategic role of breeding for the activation of important productive processes from the top (feed and dairy industry) and from the bottom (slaughtering and processing);
- consistent presence of fixed stalling breeding which ensures precious know-how (management, technology, genetics);
- the presence of some distributive industrial “market oriented” groups through a high level of vertical integration, exercising control on the entire production;
- the presence of extensive production, through the breeding of autochthonous breed, so as to valorize marginal areas.

2.1“White Bullock of the Central Apennines - PGI”

The “White Bullock of the Central Apennines” PGI is the only PGI in Italy recognised by the European Union for fresh meat and it belongs to the Italian Producers Consortium of Valuable Bovine Meat (C.C.B.I), which manages it locally through the Provincial Breeder Associations. At present the breeding of white meat cattle breeds registered with C.C.B.I. concerns eight regions (Emilia Romagna, Toscany, Umbria, Lazio, Marche, Abruzzo, Molise and Campania) for a total of about 2400 breedings.

The Protected Geographic Indication is the only PGI quality brand for fresh cattle meats produced in Italy by the European Commission with EC Reg. 134/98.

The breeds of the “White Bullock of the Central Apennines”, the Chianina, the Marchigiana and the Romagnola, which are nowadays bred as meat breeds were, up to the middle nineteenth century, used to till fields in typical Italian métayage companies.

The specific physical conformation, due to genetic heritage, but also cattle breeding and feeding techniques, give the meat from these animals specific and identifiable qualitative characteristics.

In fact, in 1993 the Ministry and the European Commission recognized the PGI brand of the “White Bullock of the Central Apennines”, that is, the meat produced from the cattle of the
Chianina, the Marchigiana or the Romognola breeds, slaughtered at an age between 12 and 24 months, born, bred and slaughtered within the typical production area according to production disciplinary measures, structured so as to be very close to the laws in force on zootechnics with low environmental impact and the recovery of border areas.

The denomination “White Bullock of the Central Apennines” given to the PGI indicates:

- “Bullock”, because the best production of cattle meat has always been obtained from youth animals, aged between 12 and 24 months, whose meat has very positive chemical and organoleptic characteristics. The meat obtained from these breeds is low in fat and rich in fatty acids, favourable for human nutrition;
- “White” because this cattle breed has a white “procelain” coat (reddish at birth, which changes colour at the age of three-four months) which stands out on the slate black skin; this allows this cattle to tolerate sun radiation very well when living outdoors;
- “of the Central Apennines” is the geographic indication of origin, since this is the area where the Chianina, the Marchigiana and the Romagnola have been traditionally bred for over 2000 years, feeding on typical forages and feed of the area;

2.2 Consortium for the Protection of the “White Bullock of the Central Apennines - PGI”

The Consortium for the Protection of the “White Bullock of the Central Apennines” has as its main aims the protection of the brand “PGI – WHITE BULLOCK OF THE CENTRAL APENNINES” to protect it from abuses and counterfeiting, the promotion and the valorisation of the product, informing consumers about the brand and its characteristics, qualities of the product as well as the general role of taking care of the interests linked to the PGI production. Moreover, it supports the programming and the coordination of production according to the market needs, implements plans for qualitative improvement and establishes a meeting point between demand and offer. Therefore, the Consortium operates so as to favour the quality of productions, guaranteeing the traceability of meats and linking the production with the distribution as a guarantee for consumers.

The cattle used for the production of PGI meats, besides being identified according to the law in force, must also meet the conditions and the requisites established by an apposite Provision on production, approved according to the laws provided in the EC Regulation 510/2006. In particular:

- the meat is produced from male and female, Chianina, Marchigiana and Romagnola cattle between the age of 12 and 24 months included. The cattle must be born in Italy in breedings that are registered in the National Herd Book, such that their pedigree can be verified. Every animal registered in the National Herd Book must be identified according to laws in force;
- the Provisions on production establish that animals must be naturally milked by mothers up to the moment of weaning. Subsequently, feeding must be based on fresh forage or supplements from herbaceous cultivations that are typical to the area of breeding (Central Apennine) within which the fattening and, later, the slaughtering must be carried out;
before the slaughtering, the cattle for the production of meat must undergo the inspection of Experts who are suitably trained by the Consortium. The Experts will brand the meat of the “White Bullock of the Central Apennines” to make sure they are recognised throughout the distribution phases. The meat is sold in cuts or sealed packages and always from fixed selling points where the meat of the “White Bullock of the Central Apennines” is kept separate from other meat and on which further demanding control can be carried out. Only these selling points can exhibit the brand “White Bullock of the Central Apennines”.

Every selling point must exhibit a copy of the Document of Control rendering information accessible to consumers. The supervision for the application of Provisions on Production of the “White Bullock of the Central Apennines” is carried out by the Ministry for Agriculture, Food and Forest Policies which has appointed a third body to carry out the control made up of the 3A-PTA Agro-food Technological Park of Umbria to carry out verifications punctually and independently.

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3 - THE MEAT SECTOR IN THE WESTERN BALKANS

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3.1 The meat sector in Bosnia Herzegovina

The meat production sector was seriously jeopardized by the civil war which almost completely destroyed the Country’s zootechnical heritage. The re-establishing of the sector was mainly started thanks to international funds. The consistency of the species of zootechnical interest, are still nowadays significantly less in relation to the exploitable surface. In 2000 the amount of imported meat amounted to 89.9 million Euros, while exportation amounted only 8.24 million. In 2006 the situation worsened: 127.2 million Euros for importation while 8.33 million for exportation. A great weakness is the illegal importation of meat from the neighbouring Countries that has created serious problems as regards product traceability, quality and health. There are about 30 meat produc-
tion industries, 30-35% of which produce cattle meat, and 50-55% of which are in the Federation of Bosnia and Herzegovina.

The average annual consumption of meat before the war was estimated to be about 100 kg per capita, as the standard of the most developed European Countries.

The re-establishing of the meat production sector in terms of zootechnical heritage, structure, production and exportation is taking place very slowly and without stability. The autochthonous cattle races of the survey area are the Buša and the Gatačko govedo, a hybrid from the Buša.

The Buša race, adaptable to very low levels of nutrition and adverse climatic conditions, has an annual milk production of 1500 litres, with a fat percentage of about 4-5%. The animals belonging to this race reach an average of 300 kg for males and 250 kg for females. The Gatačko race has better productive performance than the Buša, the average annual milk production is about 1660-2500 litres.

From the structural point of view there were more that 200 slaughterhouses before the war, 60% of which run by privates. Presently, there are about 30 medium sized slaughterhouses and many smaller ones that are not registered since they import animals illegally. Only a small number of slaughterhouses adopt quality control protocols.

3.1.1 Laws and bovine registration systems in Bosnia Herzegovina

The support of the agriculture-veterinary sector started immediately, in the postwar reconstruction period, with the distribution of animals, machinery and tools. These interventions were followed up by more structured support, with an initial effort of strengthen institutions oriented towards veterinary services, supplementary services and associationism among farmers. The overall value of this support between 1996 and 1998 amounts to 40 million uro, including 7 million allotted for the forestal sector.

Moreover, the EU has contributed with 2.2 million uro to found the “Movements of Animal Identification and Control System”, in BiH, and veterinary laboratories in five cities were equipped with tools to monitor the animals’ health. At present, live animals and animal products coming from BiH cannot be exported into the EU and in many other countries, where the consumers’ needs are protected with imported food from countries that have reliable veterinary services. After the Functional Review, the programme CARDS has included 1 million uro for the following technical assistance allotted to aid BiH to have better state authority capacities. Technical assistance has facilitated the recent completion of a “Draft of Law on Agriculture, Food and Rural Development” by establishing a work group appointed by the government. It has defined the lines of the institutional structure and competences at every level of government, including the proposal of a Ministry of Agriculture, Food and Rural Development which still does not exist and, therefore, it determines the fragmentation of the laws at enclave level. Moreover, the law defines the initial legal and institutional structure necessary for the gradual preparation of the sector for its integration into the EU. The management and control programme of the animals and their health are outlined in the law
“Veterinary” published by the Official Gazette of Bosnia Herzegovina on 22 November 2002; the Registration and the identification of every animal and ownership are essential for the implementation of the animal health programme. Bosnia has successfully started to identify cattle (refer to the Dethlefsen and Carmanns mission report). In 2006, there were about 12,000 owners with 700,000 bovines. Nevertheless, the whole process to register bovines in Bosnia will be completed within three years and there is still lack of definitive regulations for registration processes. In fact, it was declared that only dairy cattle will need to be registered and that, apparently, dead cattle cannot be eliminated from the main database and not all species are covered.

Some data regarding property and animals is voluntarily gathered by the entities, but up to this date no uniform surveying or registration systems have been established. Registration is partly restricted to the number of cattle present in a village. Some data regarding specific diseases (CSF, rabies, Brucellosis, Trichinellosis, AI etc.) is gathered. Cases of manifestation, vaccinations, samples, tests and costs are documented. Registration and identification for other zootechnics breed such as pigs, horses, sheep, poultry, bees and fish are not carried out. Support and financing for the registration of animal owners is not taken into consideration. The final identification and the movements of the animals are not monitored and traceability is not possible.

On the basis of the above-mentioned law, the veterinary authority in Bosnia is represented by the State Veterinary Office (SVO), veterinary services of the Federation of BiH, Srpska Republic and the district of Brcko. The three listed authorities are responsible for the implementation of laws and veterinary regulations.

The SVO is part of the Ministry of Foreign Trading and Economic Relations (MoFTEA) and should be the link between the ministries of BiH, the EVS and the veterinary services of the Brcko districts. Moreover, the SVO is a point of reference for international institutions. Its main role should be the coordination among the competent authorities and the attuning of the veterinary legislation in the country, as well as the improvement of the system according to EU standards.

The competent authority of the Federation of BiH, Srpska Republic and the District of Brcko are established for political and historical purposes; a centralization for political reasons that are still not acceptable. Apparently, geographic units and epidemiological sectors are not taken into consideration. The authorities themselves depend on the instable political situation of the entities. In
the long run veterinary programmes and research are undermined by political decisions such as the continuous change of ministers.

The above-mentioned authorities are subordinates to the SVO but the responsibility of the entities and the SVO are not clearly defined. The veterinary authority system in Bosnia, coordinated by SVO and the competent authorities, is not transparent.

All the representatives of the entities have confirmed that except for the Annual Order – established by the Council of Ministers – mainly local laws and regulations are followed; nevertheless, they are responsible for the implementation of laws and regulations according to the State Veterinary law. The local laws and the administrative structures of the three competent authorities are not attuned. The Annual Order seems to have a connecting role since no funds are made available through it. Therefore, to date there are no laws that establish the keeping of the Herd Books for zootechnical breeding in Bosnia Herzegovina, and even the Registry – that is, the simple keeping of a book in which ascendants are written – is not kept unless voluntarily kept by the local agricultural authorities or by the breeders themselves.

3.2 The meat sector in Albania

A thorough analysis of the zootechnics tradition in Albania has shown a strong tradition of cattle breeding; nevertheless, 70% of the domestic consumption of cattle meat is covered by the importation of fattening calves. It follows, as it has also been pointed out by the official documents of the Management for Information about Food by the Ministry of Agriculture, that the strengthening of the zootechnics sector seems to be a priority. A problem which became evident with the call of the regime is the way with which many zootechnical reproductions were carried out: with no controlling since all the structures dealing with genetic matters and their diffusion collapsed. This caused the deterioration of quality due to the inadequate reproduction material used and the lack of any type of genetic strategy for cattle, pigs and small ruminants. As things stand now the population is forced to commercially buy meat from cattle that weighs less than 100 kg with very low protein content and, therefore, scarce nourishing quality. Therefore, an action to reinforce zootechnics needs the strengthening of the presence of qualified breeds and, therefore, genetically certified, to develop commercial actions that offer qualitative indicators, which are presently inexistent, for consumers. The tendency to slaughter animals of such modest weight 100/150 Kg is due to the structures of farms: 466,809 farms, of which only 9,946 exceed 3 hectares, equal to 2.1% of the farms, do not manage to have planned management and/or systematic rotations. Studies on the sectors have shown that most autochthonous meat is produced from crossbreeds (dairy cows inseminated by European breeds: Austrian, German and France) which are sold to breeders of the milk sector on the 2/3 day from birth; or, in the case of small privates (4th-5th month), since milk, which costs about 30 Lek/litre, does not seem to as profitable for family subsistence as the selling of the calf itself.
3.2.1 Laws and bovine registration systems in Albania

Law 9426/2005 “On Breeding Management” establishes the fundamental criteria for protection, the improvement and the protection of the quality of animal genetic resources, with the aim of encouraging farmers to breed animals and to improve food product quality. As regards the topic at issue, it is worth noting the provisions included in chapter III and IV regarding the programmes for the genetic improvement of breeds: article 32 provides for the establishment of a Herd Book, kept by organisations that manage programmes regarding breeds and appointed by the Ministry, in which all the animals with the breed’s standards are registered and particular attention is given to best quality reproducers. The implementation of this part of legislation, that is, the keeping of a real Herd Book has not been put into effect since no entity/association has been nominated to keep the Herd Books. At present, given the managerial difficulties in the implementation of data registration on a district level, the primary objective is to manage to obtain a complete and correct registration of the zootechnical animals produced through programmes that are allotted the European fund support CARDS, which stands at a good point as regards cattle but still has difficulties with sheep and goats.

In the case of the Marchigiana bovine breed present with animals registered in the Italian Herd Book of 2004, at farm level, all the data registration of ascendants and descendants is carried out. Artificial insemination is carried out with semen imported from the Centro Tori of Macerata; the biological material is deposited at the Institute of Agriculture Technology Transfer in Frushe Kruja (one of the five bodies in charge at state level and present in the various regions of the territory) to control the importation, production and distribution of semen. Farms may avail of its staff of vets and technicians in charge of insemination operations as well as entertain relations with the breeders associations present on the territory.

Therefore, it can be concluded that in the last years, through the publication of the new law that have set new roles, methods and possibilities to the agro-food sector, Albania is taking various steps forward towards the standardization of procedures also in accordance with the Pact of the Association and Stabilization signed with the EU in July 2006. As regards the cattle breeds for 2008, there are state incentives for the implementation of breeding for milk production and for next year there are also incentives for the development of cattle meat breeds.

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4 - THE MARCHIGIANA BREED: THE HISTORY

Edited by:
Marche Region - Agriculture, Forestry and Fishing Service - PF Fishing and Zootecnny

4.1 From its origins to the Congress of Fermo: the Marchigiana breed: the métayage and the territory.

The Marchigiana breed has its areale origin in the Marche region and, like most of the breeds present in Italy, it can be traced back to the “Italian Podolian breed” which comes from what is called the “Podolian stock”: Podolia was a region that extended from Galizia to Ukraine. Many studies carried out on the skull of Podolian cattle breeds have indeed proven their descent from the “Bos taurus asiaticus” stock, known in Europe as the “the steppe breed”, which up to the 1800 was found in the Asian steppe with a double function: work and meat. The characteristics of the *Bos taurus asiaticus* are: a big structure, long pointed horns, grey or yellowish coat with a remarkable variety in the intensity of the colours, eyelids, tail end, horns and nails that are black in colour.

Today, it is possible to trace back Podolian cattle to their ancestors *Bos taurus primigenius* (Figure 1) of Asian origin. In fact, Asia itself is identified by many authors as being the place where bovines were first domesticated, a theory that is strengthened by the fossil findings belonging to the “lep-
tobos indicus”. This cattle has followed the human migratory flows reaching Russia, Hungary and Rumania where the “grey breed of the South Asia” stock was established.

The real history of the Marchigiana breed goes back to the 1800 and it intertwines with the historical-economical events of the environment in which it developed, accompanied by deep changes that occurred in the peculiar agricultural context of the Marche.

During the second half of the 1800, interventions of deforestation, land reclamation, settlement and setting-up of cultivations were completed in the Marche Region, where the interventions had started during the XIII century to be later interrupted in 1600 due to adverse atmospheric conditions and the plague epidemic, to be later continued in 1700. Agriculture in the Marche Region, in the early 800 was characterized by the métayage, with the agrarian pact which established that the harvest was to be divided into half between the land owner and the farmer who worked it, defining tasks, competences and duties (Figure 2). In 1600, those who worked the land could already be divided into three categories: the cultivator owners, the métayers and the “casanolanti”, that is, farmer who had no land and lived in misery. The métayage or the “farmhouse pact” made sure that on the “podere” there was only one family unit whose size would be correlated to the necessity of the workers per hectare and that among the dependent people there would not be one extra adult to feed per hectare. The métayage family was patriarchal and was governed by the “vergaro” who made business on behalf of and in the name of the family while the “vergara”, usually his wife, would take care of the house and the breeding of the yard animals.

The podere could belong to a small owner or be part of a bigger company with a single owner. This land was provided with a house (Figure 3) for the métayage family and a shed for the cattle which was the driving force for the field work and were managed by a “ploughman”. Up to the 1800, the “ploughing ox” belonging mainly to the fund owner who rented out on contract, usually on two year bases, to those who worked the land and for this work a compensation was paid, the “collara”, in kind or in money or work services. This custom hindered the cattle breeding and it is possible to say that up to the 1800 the land owner was in charge of cattle breeding. While as from the 1800 in the province of Ancona and Macerata the métayage capital began to include herds. Eventually, breeding became an industry also in poorer areas and the farmer began to give more attention to animals which until then were essential for haulage and, above all, to work the land.

Therefore, the shed became an “evil necessity” and had two functions: it was the “driving force”
for ploughing using a wooden plough and a place were manure was produced, the only reintegra-
tor element for fertility and bearer of organic matter. (Guidi and Mondini, 1985).
Cattle were not very important as meat producers and it was only used for “boiling meat”. As
regards agriculture in this historical period, cultivations underwent five or six year alternations with
the introduction of alfalfa meadows for two years and the reduction of surface with wheat.
However, in these rotations there is a lack of grazing meadows and permanent grazing lands which
made forage dependent on rotation meadows. Animal feed was frugal, characterised by forage and
all the by-products of soups and mixtures.
The cattle bred at the beginning of the XIX century was mainly from the Podolian stock whose
structure was not very big, had grey skin called marine or frosty, was rustic and with a good atti-
tude towards work both for haulage and transport (Bartolocci, 1900). This cattle was a mediocre
producer of meat given the the slow body development due to little inclination and scarce fattening
facility. (Venturi, 1893).
In order to increase the attitude for meat production, local cattle was first crossbreed with bulls
from the Valdichiana breed (Figure 5). The first cross-breeding, dated around the mid-eight hun-
dreds, produced males called “short horns” with a light grey coat, thick short horns and big in
stature (Falaschini, 1974). The fattening of the bullock concerned only a few animals of the herd
used for work and they were looked after by some of the families “casanolanti”. Table 1 shows
the production of bullocks in the province of the Marche Region in 1910 (Gaffi, 1960).

In the historical period at issue, the main breeds diffused in the Marche Region are the following:
• the indigenous Podolian breed, a mountain variety of the Marchigiana breed of the Podolian type
with qualities that are common to the Maremmana and the Romana (Palombi, 1883);
• the local “white or gentle” variety, diffused in the plain areas and it is not very suitable for weight
and with a low slaughtering output;
• the “brina” variety with a grey coat, diffused above all in the hill area and comes from the cross-
breeding between the indigenous mountain breed with the gentle variety.

Moreover, small nuclei of cattle born from the local Podolian breed and the bulls from Puglia were
present.

The necessity to select bovines with a distinct attitude towards the production of meat goes togeth-

<table>
<thead>
<tr>
<th>Province</th>
<th>Produced calves (#)</th>
<th>Number of cattle present (#)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ancona</td>
<td>2.190</td>
<td>80.459</td>
</tr>
<tr>
<td>Macerata</td>
<td>2.125</td>
<td>79.897</td>
</tr>
<tr>
<td>Ascoli Piceno</td>
<td>682</td>
<td>54.100</td>
</tr>
<tr>
<td>Total</td>
<td>4.997</td>
<td>214.458</td>
</tr>
</tbody>
</table>

Table 1: Produced calves present in the province of the Marche in 1910 (Mondini and Guidi, 1984)
er with the increase of product request and as a result, in 1902, cross-breeding with the bulls of Romagna was preferred to that with Maremmani ones since “cattle has the need to be strengthened and better bred...the lack of selection must disappear” (Sabbatici, 1910). Bartolucci, Bruni Sabbatini and Venturi established that to reach the objective of favouring the attitude to work and the production of meat the following tools were necessary:

- improvement of the gentle bulls by cross-breeding them with advanced breed such as the Romagnola;
- improvement of the mountain cattle with the careful selection of Maremmana factoring cows;
- improvement of the brina cattle through selection;
- creation of stud farms with chosen and approved bulls;
- the setting-up of Herd Books and Breeders Associations.
- adoption of evaluation standards through the filling-in of forms;
- setting-up of zoo-technical exhibitions;
- improvement of the feeding and sanitary breeding conditions (Guidi e Mondini, 1985).

In 1908 the “Permanent Provincial zootechnical Commission” was established which enacted in the province of Ancona, the “Provincial regulation for the preventive approval of bulls to be sent to public stud farms” in pursuance of law no. 392 of 5/7/1908. This was followed by the creation of the Commissions in Arcevia, Fabriano and Osimo. As from 1910 the zootechnical orientation was that of choosing the Marchigiano type and to try to crossbreed it with the Romagnolo bulls, but even so the Chianino bulls were still used.

The use of Romagnolo bulls (Figure 6) led to its importation in the main stud farms. A census of the then Ministry of Agriculture, Forestry and Industry and Trading, led with memo 31/10/1908, provides a picture of the Associations that were then present on the territory of the Marche.

The registered set-ups refer to three categories:

1. Agrarian Associations, agrarian Assemblies and Consortia that did not have breeding purposes;
2. Associations, permanent zootechnical commissions (provincial, district, intercommunal) Committees and other Entities exclusively dedicated to breeding.
3. Breeder Associations, and voluntary Trade Unions for breeding.

The concept proposed by the Ministry had the purpose of “guiding cattle zootechny towards a more modern technical and economic set up” as was already taking place in other European Countries, the Herd Book for the Angus breed was indeed established in 1802, that of Shorthorn in 1822 and that of the Hereford in 1846 while that of Charolaise in 1864.

The introduction of the Romagnolo bull brought changes to the local cattle population, improving above all the production of meat, which between 1920 and 1930 was remarkably polymorphous since, despite its particular features it did not have uniform

![Figure 6: Bull of the Romagnola breed (ANABIC, 2007)](image)
characteristics (Consolani, 1933). Therefore, there was the necessity to achieve “unity of blood and type” (Marchi and Mascheroni, 1925). In fact, a fundamental stage in the history of the Marchigiana breed was the Congress of Fermo in 1928 (Guidi and Mondini, 1985).

In this occasion, Professor Cesare Gugnoni decided to suspend every type of cross-breeding to proceed with the “functional-morphological genotype selection” to obtain cattle that was different from that of the cattle population on the Adriatic side.

That historical period is linked to a policy of ruralization which aimed at increasing field workers and, the “wheat battle” of 1925, based on a policy of national self-sufficiency, an abnormal development in the cultivation of cereal which reduced the surface of grazing lands and woods.

From a zootechnical perspective, in 1931 the Ministry of Agriculture and Forests enacted precise directives for the improvement of cattle breeds, through the selection of functional-morphological genotype selection, and more rational breeding methods (Guidi and Mondini, 1985).

In 1928 it was estimated that the consistency of the cattle population of the Marche Region was about 374,324 units, the cattle of the Marchigiana race had by then, besides a particularly suitable dynamic capacity for deep ploughing, a good ability to produce meat.

Therefore, cattle were evaluated on their functional characteristic, live weight, increase in physical structure, precocity (% live weight at 18-24 months) and their morphology.

In 1931 the Herd Book was set up and it became active in 1933, which from an organisational point of view gathered all the selection interventions carried out by the zootechnical controllers and done according to the regulations on this matter. The subjects that were chosen in this way could be registered in the Book as long as they met the breed’s standards, established in 1932, based on the weights and the main somatic marks of the animals that are closest to the ideal cattle. The animals registered in the book were grouped into selection nuclei of 60-70 cows mounted by a bull, head of the nucleus.

Due to the World War II the heritage of the cattle of the region between 1940 and 1943 was not undermined, mainly due to two factors: the characteristics of frugality, rusticity, precocious development and fattening ease and the capability of the breeders of the Marche to take care of the animals.

After a grave loss of cattle material in 1944 with the fall of borders, there was a vivacious recovery of the sector in 1945 and, in 1951, the recovery plans from Brucellosis and Tuberculosi began. (Guidi and Mondini, 1985).
4.2 The solidity of Italian breeding: the evolution from the postwar period up to the present day.

On 14 July 1959 the Provincial Breeders Associations of Ancona, Ascoli and Macerata approved the statute that sanctions the setting up of the A.N.A.B.R.M (Associazione Nazionale Allevatori Bovini Razza Marchigiana) (The National Cattle Breeders Association of the Marchigiana Breed). The Marchigiana is therefore acknowledged as “the cattle breed with the best requisites to be used in areas where the typical environmental conditions are strongly present, even in a negative sense” with reference to the territory of the Marche region, bearing in mind the increasing importance of the cattle breeding after the evolution of techniques and agricultural economy.

In 1963 the Associations of the Chianina, Romagnola, Maremmana and Marchigiana breeds merged to create ANABIC, the Associazione Nazionale Allevatori Bovini Italiani Carne (National Breeders Association of Italian Cattle Meat) whose aims are: cattle selection and improvement, programming and valorisation, even abroad, of the breeds at issue. ANABIC, with the Decree of the MAF of 18/10/1969, started managing the Herd Book of the Marchigiana breed and the Bull Register on 22/11/69, leaving the functional-morphological control up to the Provincial Breeders. Throughout the 50s and the 60s there was
an industrial development in the Country and a reduction of workers in agriculture. During this period there were changes in the Italian socio-economic tissue: mechanization exploded and there was a progressive loss in the importance of cattle as driving force, the number of farms with métayage reduced and the number of farms with direct running increased. The Marche Region underwent a change in the productive arrangement with a significant decrease of sowable land (Guidi and Mondini, 1985).

On a national scale the changes in the feeding habits of Italian with the massive introduction of meat, especially beef, improved in the population’s standard of living as a consequence of the economic miracle.

The gap that was created between the demand and the offer in the production of meat imposed real changes in the productive structures which had to face the evolution taking place in the relation between Italian agriculture as a whole and that of the European partners, within a framework that not always facilitated the participation of Italy in the communitarian agricultural policy. On 1st July 1967, in compliance with the full realization of the Common Communitarian Market, there was the free circulation of agricultural products and the organisation of the meat sector. The Country’s offer of cattle meat which was not proportional to the increase of consumption brought about massive importation of stalled calves damaging the production of Italian white breeds. Therefore, this was the beginning of a progressive decrease in the number of cattle of the Marchigiana breed with concentrated breeding especially in the high hill-mountain areas, indicating a possible vocational recovery of the internal areas. In the early 70s, most Marchigiana breed animals were situated outside the Marche. During this period functional-morphological controls were carried out by “zootecni-cal controllers” from the APA who also provided for the final registration of the bulls once examined by the “provincial zootechnical commission” (Guidi and Mondini, 1985).

As from 1982 a voluntary plan was applied to fight against Leucosis, a disease that strikes, above all, cattle with black spots but not the Marchigiana cattle breed, maybe due to lack of contact or genetic factors. In 1983 there was a decrease in the number of cattle in the Marche and this factor fits in the debate that tackles the overall decrease of the number of cattle, the massive diffusion of chemical manure and the increase of unitary yields per hectare of agrarian cultivations.

On a national scale, with the massive importation of cattle meat from the EEC, the difficulties that must be tackled are related to guaranteeing minimum amount of self-sufficiency and producing meat in a competitive manner with foreign market (Guidi and Mondini, 1985).

Therefore, the issue of Italian meat cattle breeds, of which 90,000 cows of the Marchigiana breed, is a potential tool for competitiveness.

However, the Marchigiana breed yields less than other meat breeds which leads to the necessity for an improvement of this characteristics as well as the identification of an “ecological niche” that offers an inexpensive form for its breeding.

Graph 1 (ANABIC, 2007) showing the trend, during the 1988-2007 period, related to total number of animals from the five valuable Italian breeds registered in the Herd Book, highlights the preponderance of the Marchigiana cattle breed.
Table 3 (ANABIC, 2007) summarizes, in a concise manner, the total number of animals per category and breed in 2007.

Table 2 (ANABIC, 2007) shows the number of Marchigiana breed animals and their breeding as in 2007. Table 3 (ANABIC, 2007) summarizes, in a concise manner, the total number of animals per category and breed in 2007.
To date, more than 50,000 animals of the Marchigiana breed are bred in Italy (Figure 8) and the map shows the territorial distribution.

Marche
Abruzzo
Molise
Basilicata
Lazio
Sicilia
Campania

4.3 Topicality: the breed standard

In 1923, the breed standards were established for the first time. It now channels the selection towards animals that are closer to the market requirements. The following are the objectives that the ANABIC pursued:

• maximum emphasis on characteristics related to beef production;
• greater tolerance towards “formal” and non-functional morphological characteristics;
• elimination of superfluous parts related to general zoognostic concepts;
• maximum simplicity of explanation in order to avoid subjective interpretation.

Figure 8: Italian Regions where the Marchigiana breed is found

Figure 9: Marchigiana cattle breed, RACI 2006 (ANABIC, 2006)

Figure 10: Bull from the Marchigiana breed (ANABIC, 2008)
STRUCTURE AND TYPE

Beef type characterized by notable somatic, muscle and hind-quarter development, with a long trunk that tends to be cylindrical. The Marchigiana matures particularly early and can adapt easily even to harsh environments. What should immediately be striking about the Marchigiana breed (Figure 9) is the length of its trunk, the strength of its transverse diameters and the fine-boned skeletal structure, which is light in relation to its size. Taken as a whole, it should be harmonious, agile in its movements and have a docile temperament. A large-sized beef cattle, the Marchigiana is characterized by the high daily weight increase and adult subjects can achieve a considerable weight, which can easily exceed 1200kg in bulls and 750 in cows.

COAT - White. Shades of grey spread over the front part of the body may also be seen.

PIGMENTATION – Black pigmentation that varies in intensity can be seen on the skin, mucosae oris and natural apertures. The persistence of reddish hair exclusively around the sinciput area, a grey tail and partial depigmentation of the mucosae oris are tolerable in subjects with valuable functional-morphological requisites. The breed’s white coat and the pigmented skin ensure its well-known resistance to solar radiation. Hair is white with grey shading on the front quarters, particularly in bulls. Any red hair present on the sinciput does not represent cross-breeding, but indicates the discontinuous expression of genes present in the genetic inheritance of this breed. Calves are wheat-coloured at birth and turn white at around three months. Pigmentation is pronounced.

SKIN – Thin, easy to lift and soft. The skin is fine; the dewlap and sheath are light, features that benefit the commercial value of the animal for slaughter and also perform a thermoregulatory function.

HEAD – Light, with a straight profile. The horns are short and from an elliptical section, they turn laterally and upwards. Dehorning is allowed. The head must be light, with a straight profile and a flat, light and expressive forehead, with evident secondary sexual traits; wide muzzle, powerful masseters; lively and alert black eyes, big and mobile ears. The fine quality of the skin on the facial area can be recognized through the numerous folds, and it allows the subcutaneous moisture to shine through.

NECK – Short and muscular. Massive and gibbous in males. Light dewlap. The neck is muscular, with fine cutaneous folds. The bulls have a marked gibbus even at an early age. The dewlap is light.
**SHOULDERs** – Broad, muscular and set closely to the trunk, parallel to the median sagittal plane and properly angled. The shoulder must be wide in order to constitute a broad base for the powerful muscles in the area. Proper adherence to the trunk is ensured by proper tone in the muscles of the thoracic girdle. In addition, proper joint opening between the scapula and the humerus (115°) will ensure good motor function.

**WITHERS** – Broad and muscular. Even though the withers supply third-quality cuts, they must be broad and muscular and joined harmoniously to the neck, back and shoulders. This type of structure is indicative of abundant transverse diameters and adequate muscle development.

**BACK** – Long, broad and muscular. Due to the fundamental importance of the cuts of meat supplied by this area, which help determine carcass value, this area must present marked muscle development, demonstrating a “double convexity”. This feature is determined mainly by the *longissimus dorsi* (the largest and longest even muscle on the body), which supplies cuts that are rich in muscle tissue but low on connective tissue (steaks).

**LOINS** – Muscular, thick, broad, long and straight lumbodorsal line. In addition to the longissimus dorsi, this region includes other sublombar muscles that constitute noble cuts such as filet and sirloin. The loins must be extremely muscular, long and full, demonstrating the “double-convexity”, also seen in the back, that is typical of specialized beef-cattle breeds. The lumbodorsal line must be straight and strong, denoting a suitable indication of bone structure.

**CHEST** – Broad and muscular. Chest breadth is synonymous with thoracic capacity and thus of proper function as far as the organs it contains are concerned. The sides must be arched and covered well by the muscle layer. The thorax represents an important index of constitutional strength.

**ABDOMEN** – Broad and well-supported.

**FLANKS** – Full, well-connected with the adjacent areas. Although the abdomen is broad and ensures good ingestive capacity, it must be well supported. The lower line must be practically straight, a feature typical of beef cattle with high yields at slaughter. This is an indication of good muscle tone in this area.

**RUMP** – Very muscular, well-developed in length and width; horizontal or slightly inclined from front to back. The sacral vertebrae are not very marked. Slender tail with proper insertion point. The rump, which should be as broad as possible, must offer an adequate support base for the muscles particularly the gluteal muscles that supply top-quality cuts. Moreover, rump width is an indication of reproduction function, especially as far as easy calving is concerned. A slight front to back inclination of the rump also ensures proper elimination of urine and of post-partum lochia, facilitating calving as well. The insertion point of the tail must be clean and regular and represent a harmonious continuance of the upper profile of the rump.

**THIGH** – Thick and convex in shape, with accentuated muscular development.

**BUTTOCKS** – Sloping and with a very evident convex profile. Given the importance of these areas in producing noble cuts of beef, both of these areas must naturally present an accentuated development of the muscle mass, which is also a decisive aspect in determining the value of the animal for slaughter.
**FORELEGS** – The forelegs must be perfectly perpendicular and must be set on strong solid hooves, showing solid and sharp joints. The shin must be fine-boned.

**HIND LEGS** – Proper perpendicularity, very muscular leg, lean strong hocks, solid and light shin. Since these parts are a determining factor in relation to duration of the animal’s productive career, they must be strong and have proper perpendicularity, with clean and strong joints set at a proper angle. Tendons must be well evident. The shins must be lean and light.

**FEET** – Strong, very compact, with heels set high. The foot also helps determine the duration of the animal’s career. It must be strong and very compact, and the heel must also be high. The pastern must be solid and properly angled.

**UDDER** – Well-developed, vascularized and broad-based. Regular quarters. It should feel spongy. Well-directed teats that are suitably sized for suckling. This organ must ensure the cow’s capacity to produce calves that will be heavy when weaned. Therefore, it is important that the cow produces a large amount of milk. Moreover, the udder must be shaped to facilitate sucking by the calf, particularly during the first few days after birth, a phase during which the size and the shape of the teats play a fundamental role.

**TESTICLES** – Well-proportioned and developed, descendent in the scrotum area. The shape, size and symmetry of the testicles ensure reproductive efficiency. The presence of testicular hypoplasia, monarchism or cryptorchism, or any other alternations in testicular shape mean that the subjects are not suitable for reproduction. (ANABIC, 2007).

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5 - THE DIFFUSION: THE MARCHIGIANA IN THE WORLD

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Exported for the first time in the 60s, the Marchigiana cattle breed is gaining breeders’ favour all over the world due to its typicality and the good quality of its productions which make it an ambassador for the made in the Marche, and so in “Italy”, throughout the world. In the last ten years ANABIC has extended its activity abroad, particularly in Brazil, Sweden, Holland, Spain, Australia, Mexico, the United States and South Africa.

In Europe the breed is bred in Albania, Holland, Sweden and Great Britain and there are small nuclei also in Ireland.

The Marchigiana in America

The Marchigiana breed has found such ideal climatic and environmental conditions in America that besides being bred all over North America it is also bred in States such as California, Washington, Texas; Kansas, Arkansas and Oregon.
An annual meeting is held in the state of Washington to update the consistency of the Marchigiana cattle breed heritage and to present the best specimens available on the market. At present, the number of animals of this breed registered in the Herd Book exceeds 6000 animals even if there are legislative difficulties as regards the introduction of the animals in the Country.

In Mexico, the Marchigiana breed was imported from the United States in 1995 and a remarkable increase of animals is being registered. Its genetic improvement is related to the use of seminal material from tested Italian bulls.

Certainly, Brazil is the state to experience the first and also the most consistent diffusion of the Marchigiana breed. In fact, in 1965, Dr. Ermanno Bonaspetti, following the meeting at Porto Alegre with Professor Telesforo Bonadonna of the University Milan and Dr. Alberto Vigano of ANABIC, bought some doses of seminal material from a bull of the Marchigiana breed that was well-known in Italy.

In 1966, Bonaspetti began to diffuse, among the gauchos, the sequins that he had bought. The cross-breeding between the Aberdeen Angus X Marchigiana was very successful. The first nucleus of Marchigiana cattle breed from Italy was imported in 1969.

The European beef breeds introduced in Brazil, which presently has biggest commercial bovine herd in the world, were crossbred with the autochthonous zebuini cattle through natural mounting and the artificial insemination technique.

The Marchigiana breed has shown, both in the crossbreeding and pedigree breeding, the capability of perfectly adapting to the hot and damp conditions that are characteristic of the tropical climate of the Country.

The studies carried out in the State of the South Mato Grosso on Marchigiana X Nelore crossbreeding, a local breed, have shown excellent results in weight increase, precocity in maturation and the quality of the carcass, characteristics that are particularly appreciated on the international market, confirming that the Marchigiana breed satisfies the evolution and demands of modern (Vieira Vilhena R., 2005). More than 15.000 Marchiana cattles are bred in Brazil presently.

The last world congress carried out in Italy in 2004 has reiterated and reinforced the strong collaboration and the wide international participation, contributed to the importation of semen and embryos of the Italian beef cattle breed towards the above-mentioned countries, consolidated the close relations throughout the years and created new opportunities for development and launching.
5.1 Possible techniques for the diffusion of the Marchigiana breed

One of the most efficient tools for the diffusion of the Marchigiana breed in the world is definitely artificial insemination (AI). With this technique it will be possible to export genetic material even in those Countries where it is not allowed to import animals both for health and economic reasons. AI is a procedure that involves the collection of seminal material from bulls, its evaluation and processing, as well as the conservation of liquid nitrogen; therefore, the semen is introduced in the feminine genitals via tools. Historically, this technique was used for the first time on dogs in 1780 by the abbot Lazzaro Spallanzani and it started being on livestock in the early 900s by Prof. Ivanov in Russia. In the early 30s, in Russia, about 20,000 cattle were inseminated artificially. In Europe, in 1936 Denmark founded the first AI cooperative and in 1938 the first American centre was founded at the Faculty of Agriculture in New Jersey (Foote R.H., 2002). In Italy, in the late 30s, it was Prof. Telesforo Bonadonna who gave a big boost to the diffusion of AI through the establishing of the Institute “Lazzaro Spallanzani”.

Basically, there are three technological benchmarks of AI in cattle:
1) in the 40s, egg yolk was used to improve the refrigeration of semen;
2) in the 50s, the possibility to freeze spermatozoa by adding glycerol;
3) in the 60s, the marketing of sequins and the pistolet of insemination, as well as liquid nitrogen has made the conservation of frozen semen possible for very long periods.

It is not a coincidence that the exportation of genetic material from the Marchigiana took place in the 60s-70s with the exportation of semen to South America and Canada. The semen was initially used to obtain crossbreeds with the local breeds and live animals could only be imported there (for example in Brazil in 1069) to genetically improve the pedigree.

It is worth noting that in some countries the direct importation of live animals from Italy was and is still impossible sometimes due to sanitary reasons; for example, Sweden is officially immune to paratuberculosis but not Italy. Therefore, the latter allows the importation of live animals from our country. Likewise, the first Marchigiana breed subjects in the USA were imported from Canada and eventually bred again with semen from Italy.

The production of gametes (spermatozoa, ovaries and embryos) starts from reproducers that must be immune to all diseases in compliance with the communitarian regulation (MIRAFF decree 13-01-94, no. 172 and successive modifications) and often even immune to the diseases requested by the non-EU countries. Male reproducers obtain the status of immune animals quite easily since they are taken away from immune breeding at a young age and after having been submitted to diagnostic verifications and moved to genetic centres (the ANABIC genetic centre for the Marchigiana) where the state of immunity is further controlled and maintained. The bulls that have passed the performance tests and have been assigned for AI, are taken to the semen production centres where they are submitted to a quarantine period during which the health tests are repeated and it is only then that they start producing semen. Moreover, many semen production centres carry out monthly sanitary controls so as to guarantee that the produced semen is
effectively immune to the required diseases.

Basically, there are two techniques that are used to produce embryos with certified pedigree, the MOET (multiple ovulation and embryo transfer) and the ovum pick-up:

For the MOET the donor is submitted to a hormonal protocol of superovulation through repeated doses of gonadotropin. The donor is then artificially fertilized and 6-7 days later the embryos are picked from the uterus of the donor through repeated washing. Embryos obtained in this way can be immediately transferred to the receiving cattle, even of a different breed than that of the donor or frozen to be preserved for a longer period and even transported elsewhere.

The ovum pick-up is an embryo production system that was made possible by the evolution of in vitro fertilization techniques, embryo cultivation and ultrasound techniques. In fact, it entails the picking of immature oocytes directly from the ovaries of the donor through ultrasound guided injection and the aspiration of ovarian follicles, and then the picked oocytes are matured and fertilized in vitro. The embryos obtained in this way are further cultivated in vitro up to 6-7 days, an age at which it will be possible to transfer them to the uterus of a receiver or submit them to the freezing to be transferred later.

Advantages and Disadvantages of A.I and embryo transfer

The rapid diffusion of the A.I diffusion technique in the cattle section is due to the high productive efficiency that characterizes it; a bull that is potentially capable of producing a few hundred thousand of doses a year and, therefore, a high number of off-springs. This has made it possible to carry out accurate tests on descendents and to diffusely use semen from bulls with high pedigree. In this way extraordinary genetic and productive progress has been obtained especially for diary breeds. On the other hand, A.I has other advantages: breeders cut down on costs (they must not maintain the bull or bulls), the eradication of many diseases particularly venereal ones, the inspection by pathogenic agents (antibiotics in menstrual diluters), reduction of congenital pathology incidence, reproducers found elsewhere can still be used, the use of deceased male semen can be used over time, reduction of risks linked to coupling (kicks, bites, falls, etc.), seminal material may be evaluated and, in recent years, the “sexing” of spermatozoa is also possible. Moreover, when associated with the synchronization of heats, it makes the seasoning of the herd’s reproductive activity possible without damaging the genetic selection.

However, there are also advantages linked to the application of A.I, some of which are particularly felt in the beef cattle section. On the one hand, the IA needs well trained technical staff to carry out the picking, the evaluation and the preparation of the semen (refrigeration, freezing), the cost of which is presently covered by AIA and other public and private entities (Regions, banks, etc…). A great advantage when applying this technology is the possibility to choose the best time to carry out the insemination. Training staff to carry out instrumental insemination is relatively easy but recognizing heats is still a difficult obstacle to overcome. It has been calculated that in the United States the loss due to difficulties with the detection of heats in dairy cows
amounts to more than 300 million dollars; for this reason various technical aids have been set up for the detection of heats (Dransfield et al., 1998; Nebel et al., 2000) as well as various protocols to synchronize ovulation that make it possible to predetermine insemination times without detecting heats (Stevenson J. S., 2001). Moreover, to manage AI correctly it is necessary to keep the shed charts updated to be able to monitor: heats, fecundation interventions, pregnancy diagnosis, etc... In fact there is always the risk to cause abortion if the technique is applied on a pregnant cow. The massive use of few male reproducers causes the inevitable risk of increasing the consanguinity of the population increasing the risk of diffusing hereditary pathologies (e.g. CVM, ovarian cysts, etc.). The incorrect application of sanitary laws is associated to the increasing risk and the diffusion of some diseases (scarce hygiene of the staff responsible for insemination).

The greatest disadvantage of embryo transfer, in the case of MOET, are linked to the variability of superovulation in the donor which does not allow to foresee the number of embryos that may be picked after treatment. From statistics available in literature (IETS) it is estimated that 5 or 6 embryos may be obtained from every animal.

Diffusion in the Western Balkans: the Activities of the Marcbal project in Bosnia Herzegovina

The MARCBAL project has among its objectives that of increasing the diffusion of the Marchigiana through the application of embryo transfer applied on donors of different breeds and embryos that have been produced in vitro from oocytes picked from heifers with high pedigree using the ovum pick-up technique. It is an experiment on a small scale to verify the applicability of this approach on an industrial scale both on a national level (increasing factoring cows of breeds that are decreasing) and outside the national borders to diffuse the Marchigiana breed in the Balkans. The Simmental (Italian Pezzata Rossa in Italy) is the breed that was given priority when the receiving cattle was being chosen, given its good maternal attitude, remarkable ease in delivery, its adaptability to hill climate and its diffusion in the Balkans. The project included Activities in Italy and in Bosnia Herzegovina.

Ten zootechnical farms were chosen in Italy with the collaboration of the technician of the local breeders association (AAFVG) since September 2007. Gynaecological check-ups were carried out on these farms to monitor the condition of the reproductive apparatus and to choose Marchigiana breed animals suitable to receive embryos. The type of animals selected was that of pubescent cows with no reproductive apparatus pathologies. Through this activity, 20 cows between 13 and 18 months old, included, were selected and bought by the breeders of the Abruzzo region to increase the diffusion of the Marchigiana breed within the region by forming breeding nuclei with cow-calves lines (cow of the Italian Rossa Pezzata and the Marchigiana calves produced by embryo transfer). Along with animal selection, a shed in Friuli, with Pezzata Rossa cattle, was chosen for embryo transfer operations. This choice was based on the necessity for frequent clinical check-ups and accurate synchronization protocols for the receivers and
it would have been impossible to accomplish them in Abruzzo in field conditions; in addition, video/audio material was prepared during this activity for the exchange of know-how among the EAC countries. Indeed, it is worth recalling that one of the objectives of the project is the diffusion of technical knowledge for the management of cattle reproduction, especially embryo transfer in the Balkan countries. The animals were moved to the “experimental” shed on 23rd December 2007.

Technologies of in vivo and in vitro embryo production of the Marchigiana breed were set up with the collaboration of ARA Abruzzo and the Consortium for the Increase of Zootechny (LTR – Laboratory for Reproductive Technologies). In particular, given that in vivo embryo production through MOET was found to be expensive, due the high number of donors necessary or the very long production times, in vitro production was used collecting oocytes through ovum pick-up. For this purpose, the production of in vitro embryos and their freezing started taking place during the last months of 2007.

Embryo transfer into the 20 receiving heifers of the Pezzata Rossa Italiana (PRI) started in January 2008, with the synchronization of 6 receivers (the most suitable for reproduction) which were submitted to embryo transfer on 18th January. Embryo transfer interventions were continued until 9th June 2008. During these 5 months (9th January – 9th June 2008) the animals were submitted to check-ups twice a week to monitor the reproductive activity and to carry out synchronization protocols; moreover, about 20 days after embryo transfer, the receivers were submitted to diagnostic ultrasound tests. An overall 41 embryo transfer interventions were carried out, on 38 of which an early pregnancy ultrasound diagnosis was carried out on the 25th-27th day of gestation, while it was not possible to carry out diagnosis on the other 3 interventions since the animals had already been moved to Abruzzo. 14 gestations (37% of those that had taken root) resulted out of the 38 pregnancy diagnosis carried out. Gestation diagnosis was confirmed on the 35th and 60th day. These interventions showed 1 early reabsorption (35 days) and a late one (60 days); therefore, the 12 diagnosis were confirmed (an overall 32%). The 3 animals moved to Abruzzo before the 25th day of a presumptive gestation are still to be diagnosed.

In October 2007, the first mission to identify breedings was implemented in district of Bihac, in Bosnia Herzegovina, according to the choice of farms and cattle to be used as Marchigiana breed embryo receivers so as to increase the diffusion of the breed in the region and to form breeding nuclei. Five breeders interested in this activity were identified, all of which dedicated their activity to the production of milk with rather modest productive averages (15-25 quintals/lactation). Given the lack of veterinary staff with experience of embryo transfer interventions, it was decided to synchronize the animals and to carry out the embryo transfer directly at the expense of the UNIUD partner. The protocol of the synchronization of heats in the receivers was sent to the Bosnian partner at the end of October 2007.

In January 2008, the Bosnian partner bought and received 20 embryos of the Marchigiana breed with high pedigree which were to be used for the diffusion of this breed in Bosnia. On 23rd February 2008 the first mission was carried out in Bihac (Bosnia Herzegovina) to carry out the
first embryo transfer on synchronized animals according to the protocols that were previously sent to the Bosnian partner. Upon the first check-up, none of the synchronized animals were suitable for the embryo transfer, and for this reason it was agreed that the operation would be repeated at the end of March on a greater number of animals. Nevertheless, local veterinaries were instructed about the correct techniques and procedures for embryo transfer; in addition, a lack of equipment essential for the procedure was noticed. The Bosnian partner made arrangements to buy the necessary material from Italy (pistolet of embryo transfer, sanitary sheaths and jackets). Moreover, once it was found that the type of animals that breeders chose for the activity were not the best, agreements were made with the Bosnian partner to further educate the local breeders. In particular, the breeders’ tendency was that of using “old” animals (3-4 deliveries) for this activity, while the best results are obtained from more fertile animals (heifers or primipara); this tendency was due to the breeders’ dread as regards this technique which was completely new to them and the fear that the Marchigiana calves may cause delivery problems in young cattle. Therefore, it was explained to the breeders that the technique does not present any health risks for the animals and that one of the characteristics of the Marchigiana is that of having relatively small calves which cause no difficulties at delivery.

On 29th and 30th March 2008 a second mission was carried out in Bihac, effecting check-ups on 9 cows, 4 of which resulted to be suitable for embryo transfer. Out of the 4 cows submitted to embryo transfer, one was pregnant upon the diagnosis carried out on 18th May 2008 (25% of the taking root rate). On the same day, 18th May 2008, check-ups were carried out on 14 animals which had been previously synchronized, 9 of which were suitable for embryo transfer. Pregnancy diagnosis is still to be carried out on the latter cows submitted to embryo transfer.

5.4 Financed intervention programmes for the promotion and the diffusion of the breed in the Western Balkans

Within the framework of the various communitarian and national financing which are placed to the avail for the internationalization of enterprises and for international and cross-border cooperation, at public and private levels, for the development of third countries, various financial systems or managements that promote actions in the agricultural field are available. As regards the Marchigiana cattle breed in particular, a call for bids, launched by the Ministry of Productive Activity, now Ministry of International Economic-Trading Development, was set up. The call for bids was based on law 212/92 which provides for the bilateral and multi-national programmes for the promotion of collaboration of Italy with the Countries that are identified every year by CIPE upon the proposal agreed between Ministry of Foreign Affairs and the Ministry of Economic Development to encourage transition towards market economy types and the integration with Europe. The users of this financial tool are the public and private entities who present projects with a maximum duration of 24 months for training, assistance, feasibility studies and pilot projects in the various sectors of economic intervention.
The project “Marchigiana. Pilot Project for the Introduction of the Marchigiana Cattle Breed in Albania” – classified first in the 2003 management – promoted by Comes S.r.l. of San Benedetto del Tronto, had as its primary objective the promotion of the recreation of cattle breeding and the feeding self-sufficiency in Albania. Institutional and main partners who support the initiative are the Marche Region and the Ministry of Agriculture of Albania which ensured the public-private characteristic of the intervention with a set of intentions which, on the one hand, ensure the entrepreneurial development through professional training and the transferring of breeding techniques and technologies while, on the other hand, promote social development linked to the recovery of areas and sectors with marginalized economic development, at an institutional level. The project lasted 13 months – in which other Balkan local partners, that is, the Institute of Zootechnical Research and the Shoqata Alba-Markexhana as well as the Italian associations linked to the breeding of Italian beef cattle (APA, ANABIC, Bull Centre of Macerata, etc.) have collaborated – realizing the objectives to introduce the Marchigiana cattle breed in Albania, verify its adaptation and further develop the breed on the Balkan territory, transfer breeding techniques and technologies through vocational training addressing quality and sustainable factors. During the chrono-programme project, the phases that were completed by the partnership were the identification and the hiring of lands and the start-up of forage cultivations, the building of a first model shed, the training of managerial staff and shed technicians, the purchasing of pregnant heifers at various gestation stages and their transportation to Albania, the purchasing of equipment, the purchasing of biological material for artificial insemination and assistance for the management of the plant until all factoring cows had delivered and weaned the first calves. At the end of the project period, an Italian-Albanian company limited was purchased, and still owns the plants and animals.

Geographically the project was situated in the commune of Çerme - a district of Lushnje – an area with a strong agriculture vocation, with the aim of recovering not only traditional cultivation but also breeding. Cultivation for the sustainable feeding of animals was reintroduced through forage produced on farms by recovering cultivation techniques and mechanized tilling. It is worth noting here the critical state of the high fragmentation of property – the average fractions are 1.5 hectares per owner – and the high costs of property when bought or hired.

However, an increase in employment was ensured through specialized training for staff who manage the sheds daily; through a learning by doing programme – that is, their direct insertion in an Italian company for a 3 week period of apprenticeship training – and, subsequently, the employees carried out further vocational development on local sheds, promoting also an increase in the employment of tertiary services for breeding activities.

As regards adaptation and the number of births registered three years from the closure of the institutionally financed project, the characteristics of the Marchigiana breed were confirmed both for its adaptability and its preservation in environments not typical of their “origin” with a high attitude towards beef production (growth velocity, precocity and slaughter yield). The number of animals present in sheds increased from the 20 heifers imported from Italy to a total of 33 ani-
mals (imported heifers and calves born in loco) at the end of 2004, and 74 animals at the end of 2007. Given the high number of female animals that were born – which has promoted a more rapid development of the number of animals which to date have increased through natural rhythms of delivery-between pregnancies-artificial insemination or natural mounting – only 3 male animals were slaughtered in 2006 and 8 in 2007. In fact, the marketing of beef took place through channels internal to the company even because the number of animals is still insufficient for the insertion in big distribution channels. Nevertheless, it is worth noting the critical factor linked to the Albanian “tradition” to slaughter 4-5 month old calves which creates a discrepancy in the cost of beef present on the local market and that of the “Marchigiana” whose cost is linked to the traceability and quality but also the production.

Certainly, to date the project has been in line with the process of stabilisation and standardization that the Europe Union promotes in Albania and also in line with international cooperation that the Italian government expects in the developing Balkan areas. Nevertheless, it is to note that the promoted financial tools are limited by the availability granted by European and national funds that do not allow the management upon yearly or fixed call for bids (for example, the last management according to 212/92 took place in 2004). Specifically, as regards the 212/92 there has been difficult to understand and apply the co-financing tool – a maximum of 50% - in areas where the economic contributions were received as unsecured “donations” as it had happened in Albania itself.

The greatest success of the project financed by 212/92 – besides the obvious objective of introducing and implementing the development of the Italian cattle breed of quality beef – was surely that of creating a network of relations among public and private subjects that are still collaborating and debating on the issues of sustainable development in agriculture. If in the Balkan area there is a significant progress – especially in terms of legislative regulation – in the objectives of increasing the zootechnical heritage through genealogy of animals, it is to highlight the effort of the Italian partnership in giving continuity to the previous experiences through principles of good collaboration and real cooperation oriented towards development and also the promotion to use other Italian and communitarian financial tools to implement follow-up projects not only in Albania but in the other Balkan regions.
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6.1 The objectives

Selection is the main tool for genetic improvement. Within the selection programme to choose the reproducer it is essential to evaluate the following characteristics:

• morphological;
• physiological;
• genetic.

In the zootechnical sector the features with the greatest economic importance, defined as zooeconomical, are the quantitative characteristics defined by the action and the interaction of various genes, each of which contributes to the expression of the character phenotype. The quantitative features are subject to continuous variations due to the variability of the genetic endowment of the individual and that of the environment; however, it is still possible to measure its value within the variation range. The difficulty to evaluate the reproducer lies within the difficulty to discern how much can be attributed to the genotype and how much depends on the environmen-
tal conditions.
The selection of the Marchigiana cattle breed is carried out by ANABIC and aims at:
• the production of subjects with an outstanding attitude towards beef production, in terms of
growth velocity, precocity, slaughter yield and boning, safeguarding its capacity to adaptation to
breeding systems;
• the improvement of maternal attitude, that is, facility to delivery and produce calves with a high
weight when weaning, and the reproductive efficiency features such as age at first delivery and
the interval between pregnancies, so as to obtain a greater number of calves per cow a year.

Male line and Female line
The value of a subject as a reproducer is its genotype value. The evaluation score of a dairy bull
reproducer is calculated through:
• the test of the ascendants;
• the progeny test;
• the BLUP-ANIMAL MODEL method.

The test of the ascendant is based on the pedigree index and is the only method that estimates the
genetic value of a young reproducer. The calculated indices are:
• Pedigree Index (PI) = 1/2 TGI father + 1/4 IGT maternal grandfather
• Expected Genetic Index (EGI) = 1/2 IGT father + 1/2 CGI mother

The progeny test is a method used for the genetic evaluation of a reproducer based on the produc-
tive performance of the off-springs.

The genetic evaluation of the productive and morphological features are carried out through the
BLUP method (Best Linear Unbiased Prediction), theorized by Henderson in 1953 and applied for the
first time by Cornell in 1972 to be later diffused also in Europe. The ANIMAL MODEL takes into con-
sideration all the relatives present in the cattle population. In so doing, the genetic values of all the
animals in the population are used and estimated at the same time.

Bulls can be classified according to this method which is based on
mathematical indices obtained by comparing reproducers.

Genetic evaluations
In genetic evaluations, all the information collected during the
selection activities (Genetic Centre, Herd Book, Functional
Control, morphological Evaluation) is used to estimate the genet-
ic value of the reproducers, identifying the best ones according to
the defined selection objectives. For this purpose, using appropria-
ate analysis models, the productive, reproductive and morpholog-
ical data is purified from the environmental effects; the values
obtained in this way, together with the Indices, determine the
genetic value of every subject. This sector is responsible for the
study and the definition of the models of analysis for the indexing of reproducers. Particularly, it involves the calculation of the Bull Selection Index of subjects that are submitted to a performance test based on the BLUP-Animal model which evaluates growth and muscularity features; it also uses data regarding the weight collected on farms and the information related to the morphology and the reproductive efficiency to further process the genetic index of the reproducers being selected.

The Growth Index takes into consideration the growth from birth until the performance test (30%) and the growth during the performance test as a regression line upon the nine registered weightings. Muscularity derives from the linear evaluation items, considered on the basis of their incidence in each region and the total value of meat obtained from the animals.

Subjects that, at the end of the trial, present a Bull Selection Index that is within the best 30% will be assigned for Artificial Insemination, while the remaining 70% will be used for natural mounting since they still have no defects and have a linear score of 82.

For female subject the Cow Selection Index is estimated, by calculating the above-mentioned Bull Selection Index and the phenotype morphology index to identify those subjects that, when crossbred with the tested bulls, will produce calves which will have priority to enter the Genetic Centre. Moreover, the Cow Selection Index is a valid technical support for breeders when choosing cows for mounting and to manage the genetic lines of their breeding.

The Genetic Index of Morphology has been introduced in 2001, based on the evaluation of the heifers' muscularity, size, leanness and limbs, which will be included in the Bull Selection Index of the factoring cow (pedigree or genetic) to form a new Cow Selection Index. As from 1st January 2001 to give birth to bulls, cows must have obtained a Cow Selection Index higher or equal to 100 at least once.

**Morphological evaluation**

Morphology is fundamental in beef cattle since, together with productivity and pedigree, has a functional significance for the capability to produce muscular tissue.

The morphological evaluation, defined by the central Office of A.N.A.B.I.C. in 1994, produces linear descriptions, with scores that go from 1 to 5, made up of four items: muscularity, size, limbs and thinness of the animal. The final or morphological score implies whether the subject will be registered or not in the breed Herd Book.

The linear evaluation system consists of the quantitative measuring of certain features, giving each of them a clear numeric value on a scale (linear) that goes from one biological extreme to another. The variable was sub-divided; a certain feature of the population is divided into five classes (values from 1 to 5) using, in the case of measurable features a module equal to a standard deviation of 1.5 of the considered feature, while for features that are not measurable the morphological extremes estimated by the breed experts are to be used.

The evaluation chart includes a part on breeding and a general part on the subject, a summarized evaluation, a linear description, indications of strengths and defects and a part with codes.
6.2 The tools

**Selection plan**
The selection plan is a genetic improvement tool that defines the modalities and the timings of data surveying, the evaluations of reproducers and, above all, the relations between the selected and discarded animals (Bittante et al, 1990). The results of a selection plan are measurable in terms of average annual growth of the subjects’ genetic value (Mantovani et al, 1997; Mantovani & Picozzi, 2003) which is influenced by elements that are not directly modifiable by those running the selection plan as well as elements susceptible to variation. Among these, susceptible to species reproduction efficiency and their interdependency, are:

- the modality of the implementation of reproducers’ genetic evaluation which effects accuracy;
- the relation between chosen and discarded subjects;
- reproducers’ substitution age.

For the Marchigiana cattle breed the selection plan is based on:

- genetic evaluation of the male reproducers to be used for Artificial Insemination through the performance tests;
- evaluation and choice of factoring cows based on maternal attitude and reproductive efficiency;
- targeted coupling;
- progeny test for features that are not directly identifiable during the performance test.
The performance test is based on the genetic evaluation of subjects submitted to performance control in a controlled environment. These tests are carried out, both for the Marchigiana breed and the other four Italian beef breeds, at the ANABIC Genetic Centre. Initiated in April 1985, 190 calves a year are now submitted to evaluations.

The animals that enter the Centre, at 5 months old and in groups of 15 (five from every breed) have already been chosen according to:

- the genetic potentiality of the parents (BSI and CSI) giving priority to calves from tested bulls born from programmed coupling with Top Cows;
- the morphological evaluation carried out by ANABIC experts;
- the analysis that check paternity and maternity;
- the analysis of the karyotype which will exclude subjects with a chromosome arrangement 2n=59.

Once the serological tests for TBC, Brucellosis, Leucosis, IBR and Blue Tongue are passed, the calves will be submitted to a period of quarantine which will give them the opportunity to adapt to the new feeding and breeding conditions. At the end of this phase, the group will be moved to a performance shed which will host them until the end of the test, that is, when they are 1 year old.

The performance test lasts about 24 weeks and consists of:
- double weighing on 2 consecutive days, every 21 days;
- double zootechnical surveying, on 2 consecutive days, at the beginning and at the end of the test;
- measurement of scrotal circumference every 3 months;
- data surveying regarding muscular development, at the end of the test.

The registered data will be processed with the BLUP Animal Model with which, through the indexing of the Growth and Muscularity features, the effects of genetic and environmental factors can be estimated together with the performance of the subject and all its tested relatives. (Filippini, 2004).
The Herd Book

Set up in 1961 with the objective of promoting and implementing all the initiatives aiming for improvement, valorisation and the diffusion of the Italian autochthonous cattle breeds: the Marchigiana, the Chianina, the Romagnola, the Maremmana and the Podolica, the Herd Book is the primary tool for the selection of the various species and breeds of zootechnical interest. First and foremost it aims at preserving the genetically distinct animal populations by defining the criteria for genetic improvement from a technical aspect and, at the same time, promoting its economic valorisation.

According to Law 30/91 the "Herd Book is the book that is kept by the national breeders association with juridical standing or a public entity, in which reproducer animals of a certain breed are registered, indicating their ascendants and which have been submitted to tests for their productive attitudes".

In pursuance of this law, the ANABIC (National Italian Beef Cattle Breeders' Association) was appointed to keep the National Herd Book and the Genetic Evaluations of the Italian beef cattle breeds, that is, the Marchigiana, Chianina, Maremmana, Podolica and Romagnola breeds.

Registries are defined according to law 30/91: «A Register is a book kept by the national breeders' association with juridical standing or a public entity, in which reproducer animals of a certain breed are enrolled, indicating their ascendants». Therefore, breeds and populations that are little diffused are registered in "Simplified Herd Books": Registers. Their purpose is not only to effect a population selection which often risk extinction, but rather that of preserving the genetic heritage of great historical-cultural value by valorising the productive qualities and promoting their use in specific environmental conditions.

Within ANABIC there is the Central Herd Book Office, which coordinates and controls the work carried out by the Provincial Offices situated at the Provincial Breeders Associations (APA) and spread all over the national territory.

It is divided into 5 sections, one for every breed and it gathers all the personal, genealogical, morphological, productive and reproductive data of the selected cattle into databases.

The organisation of databases which began in 1988 has brought about the implementation of a system of remote registration, management and information exchange.

In 1992, the "DATAGEST" procedure was created and developed to manage data at the Central Office and the Provincial Offices of the Herd Book; it has been constantly updated so as to improve the service that it offered to APA and breeders. Through this procedure it is possible to register information on the breeding, at a provincial level, and to process it in order to obtain statistics on reproductive (age at first delivery, intervals between pregnancies, etc.) and productive (weight, average daily growth, etc.) data, summaries and guidelines to hypofertility services and certifications (Pedigree Certificates, EAC awards, etc.).

At present, given the agreement stipulated with the Italian Breeders' Association, this procedure was adopted by about 70 APA, which have applied the computerized system even in other Associations for the beef breeds or other smaller ones. In 1999, a procedure was implemented...
for breeders, allowing them to manage the personal, reproductive, productive and genetic data of the herd (this programme has about 200 user members). Nowadays, all information exchange is done via Internet. The servers are directly maintained by ANABIC, without accessing external providers. APAs can download all the useful data through the internet website of ANABIC, in order to keep their archives updated and to provide services for breeders. (ANABIC, 2005).

**Coupling**

With the constant commitment of the Associations, at various levels, and of the breeders, who participate directly in the selection of the Marchigiana cattle breed, an excellent genetic, morphological and functional progress will be certainly achieved, rendering the Marchigiana particularly competitive with other breeds at a global level as regards the beef market. When the genetic index is calculated it is possible to carry out targeted coupling using indexed cattle and, therefore, favouring the completion of the selection plan with the birth and the selection of young calves from the next generation to enter the Genetic Centre. The coupling of indexed subjects, mothers of bulls and bulls, gives a further drive to the genetic progress.

Programmed coupling, which was defined and experimented in 1997, became a routine in 2000 providing breeders with the opportunity to improve the morphological and productive level of their cattle. The service was offered on three levels: **standard**: free of charge, produced every six months and sent to APAs involving the coupling of all cows with a single bull; **personalised**: produced upon breeders’ request, supplied upon payment and involves the coupling of all cows with the three best bulls available; **automatic personalized**: upon payment, the personalized parameters are registered during a first phase, subsequently the procedure is automatically processed even for more than one breeding. At present, according to the statistics of ANABIC the Programmed Coupling service is mainly used for the Chianina, Marchigiana and Romagnola breeds, for which 35,000 couplings are arranged every year.

Programmed couplings can be carried out on all the cattle evaluated with a linear morphological chart which will therefore be coupled with the best bulls using artificial insemination (AI). For every cow with the CSI, especially the top ones, will undergo programmed coupling with the most suitable bulls, in order to obtain the best calves. Once the best reproducers are identified through the performance test, they are carefully used to diffuse their genetic heritage in the quickest possible manner during the next phase of the selection plan. In order to increase the annual genetic progress there must be a reduction in the generation interval and it is important that the best reproducers start their careers as early as possible. For this purpose, the young bullocks chosen for AI are immediately sent to the collecting centres and their semen is diffused throughout the entire population. With a specific coupling programme, these subjects are used with the top cows which have a high maternal capacity index. The male calves, born from these couplings, have the priority to enter the Genetic Centre, to be submitted to a new performance cycle, therefore, initiating the work of the next generation.
The **standard programmed coupling** with an apposite programme takes the following factors into consideration:

- coupling must not exceed 10% consanguinity;
- the animal trait that needs correction is privileged even if lower than the average;
- when all the traits are balanced, the programme suggests using bulls that compensate and that have no defects;
- coupling is rejected if the bull and the cow have structure or limb defects and the programme couples the bull’s corrected trait to the cow’s faulty one;
- keeping adequate genetic variability so the programme uses a rotation of bulls depending on the number of times they have been used.

The **personalized programmed couplings** let every breeder personalize the coupling of his cows with suitable bulls, mainly following his specific needs. During the farm visit, the breed expert will register, using apposite Company Surveying forms, what the breeder intends to transmit from his cows on to the off-springs through programmed coupling. For example, bulls that can be used for artificial fecundation can be favoured over bulls with Higher Genetic Parameters or superior Phenotype or Functional Parameters, or the breeder might put restrictions on the use of desired or undesired bulls or else choose features that must be corrected.

### 6.3 The prospects

As from 1993, in the areale of origin, some Marchigiana breed specimens with muscular hypertrophy were identified. A characteristic which even in the last century had been noticed in various beef cattle breeds, manifesting itself as a muscular development that is superior to the normal one producing a remarkable yield increment.

Therefore, experiments are being carried out to form a nucleus of hypertrophy subjects and, eventually, evaluation on their productive and reproductive performance will be carried out to understand how these characteristics can be used.

At present, the efficiency of the selection plan has been verified, identifying the best aspects. There will be an enlargement of the Genetic Centre.

The Genetic Evaluation Office, in collaboration with the University of Padova, is revising the system used to calculate the Performance Indices in order to improve it.

Moreover, a study is being carried out on the data for the calculation of the Maternal Capacity Index with which female subjects are selected according to their capacity to lead the calf to weaning in an autonomous manner, with the highest possible weight. Therefore, the Index is considered to be an indicator of milk production which is necessary to accomplish this task and, economically, it is very important for the herd's management economy, especially for the grazing and semi-grazing breeding systems.
A system that evaluates the family relations of the animals in the living population has been set up to identify the least present genetic lines and to evaluate the diffusion of the pedigree of every subject with respect to others.

As from 1/01/2008 the central office of the Herd Book has made the deposit of biological samples from all the registered animals obligatory, so as to ensure the origin and the traceability of the subjects (ANABIC; 2007).

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7 - THE BREEDING AND THE FEEDING

Edited by: Polytechnic University of the Marche - Faculty of Agriculture - Department of Environmental Sciences and Crop Productions: Agronomy and herbaceous Cultivations

7.1 Breeding systems

The environmental characteristics of a territory strongly effect the type of breeding systems present on it, determining the different distribution of the productive types, the company size and the interrelations between farms and other productive sectors. The Marchigiana cattle breed breeding is found in territorial contexts that are characterised by extreme variable pedo-climatic and socio-economic conditions, and it is capable of differentiating its productions using the resources that are available in and obtainable from the various territorial contexts. In most cases it is characterised by semi-grazing breeding (which includes a period of grazing in the good season and a stalling period during the bad one) in the internal areas while more intensive and specialized stalled systems (animals stay in sheds all year round) are adopted in the hill areas and in the valleys (Table 1).

<table>
<thead>
<tr>
<th>Breeding system</th>
<th>Diffusion area</th>
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<tr>
<td></td>
<td>Mountain</td>
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<tr>
<td>Semi-grazing</td>
<td>Prevalent</td>
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<tr>
<td>Stalled</td>
<td>Decreasing</td>
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Table 1: Distribution of the breeding systems in the various territorial areas
Given the grazing resources, the semi-grazing system is the one that is mainly used in the production of cow-calf lines (Figure 1) since it reduces feeding and labour costs. The areas defined as “marginal” (both in mountain and high hill areas) can exploit this system, due to their pedo-climatic and geographic characteristics.

Moving towards the hill area, where the stalled system is used, the production of the cow-calf line often goes along with fattening activity, both in males and females, according to the availability of lands that can be used for the production of grains for zootechnical purposes. When this is possible there is usually a drop in feeding costs. Indeed, for zootechnical companies feeding is a particularly important cost item in the case of beef bullock production. In order to obtain efficient results from the technical and economical perspective, the company that pursues this type of production must have the suitable characteristics as regards size and the possibility to obtain forage that allows, at least partially, self-sufficiency in feeding cattle.

In the littoral hill area and the valley, where agricultural is more specialized, beef cattle breeding reflects the productive intensification. In this context, where high productive standards are reached (daily increments, carcass quality, etc.) the maximisation of the process of productive specialization has been registered, even in the production of animals with high genetic value that bring about a high added value for the company. This shows that the great versatility of the Marchigiana is due to the possibility of breeding it using different systems both for beef production and for the use of bulls for crossbreeding.
An analytic description of the organization of the breeding systems is given below, with particular reference to forage aspects, present in the mountain, hill and plain areas of the Italian territory, in order to register the differences and the typicality of the reference areas. This analysis is based, both on the specific cognitive survey conducted within the Marcbal project, as well as the wider surveying of the sector of Marchigiana cattle breed breeding carried out by the authors. For every area in which breeding occurs, difficulties and priority interventions are described and defined. The latter may be useful in the planning of zootechnical activities not only on Italian territory but also for the Balkan areas. Likewise, useful research proposal for the setting up of rational and sustainable breeding systems in the various territorial areas are defined, also as a result of comparisons made with the colleagues from Bosnia-Heregovina and Albania involved in the Marcbal project during the project meetings and the hands on visits held on Italian, Bosnian and Albanian territory. The main research and experimental activities carried out on the many problematic aspects, which have already taken place or are still in progress, have also been described. These have been carried out by the Department of Environmental Science and Crop Production of the Polytechnic University of the Marche in the various areas where cattle breeding systems are used. This was done in order to promote the exchange of technical-scientific knowledge and experiences as foreseen by the herein project. According to the analysis of these results and the difficulties that arose during the long-term experimental activities, and upon comparison with both Italian and foreign project colleagues, specific in-depth research and experimentation can be planned for the promotion of rational and sustainable breeding systems in the various areas of the project.

### 7.2 The mountain area

In the mountain area the Marchigiana cattle breed is mainly bred according to the semi-grazing system and, to a lesser extent, according to the traditional stalled system. The greatest diffusion of the semi-grazing is mainly linked to the typicality of the pedo-climatic factors. The climatic conditions (low temperatures and snow in winter, drought in summer), the type of land (not very deep, high skeleton presence) and the orography of usable surface (Sarno et al., 1989), negatively condition the productive potentiality of the mountain area. These conditions bring about the high presence of grasslands, both of spontaneous and secondary origin (present beyond the potential limit of the woods), and natural (those exceeding this limit) to be used for grazing or the constitution of forage supply to be used during the stalling period.

The semi-grazing system in the mountain area mainly uses vertical transhumance. This involves moving herds locally towards grazing lands, for short distances, on foot or by means of transport. Sometimes permanent breeding forms are also used, in which grazing of pastures and artificial grass-pastures are used in the areas close to the farm. The stalled system is used on small sized farms with simplified management on which the farmer is of a certain age. Breeding for which the traditional stalled system is used are moving towards more extensive methods. Apart from the
many socio-economic and cultural factors, the reasons that seems to justify this trend are the low production costs associated with the semi-grazing system, the greater availability of grazing lands due to the abandonment of agro-pastoral activities in the mountain areas, the reduced availability of labour and, not the least, the difficulty to adapt to the regulations that now regulate and condition the activities of this sector.

In the semi-grazing system, the grazing period usually lasts from June to September. With favourable climatic and productive conditions, grazing can be anticipated to the month of May and can last till October and November. The most diffused grazing modality is free grazing on grazing lands, which often have no fencing, in which animals, during the grazing season move to higher levels, according to availability of fresh forage. As from the end of August the animals progressively return to lower levels or, depending on the productive category, the climatic conditions and the availability of forage, are moved to grazing lands of nearby farms or put in sheds. The registered volume values are usually less than UBA ha'. The prevalent use of spontaneous grazing lands of various types depending on the floristic composition or the environmental characteristics of the diffusion areas has been registered. The most represented classes are Festuco-Seslerietea, Festuco-Brometea, Molinio-Arrhenatheretea and Nardo-Callunetea. The productivity of grazing lands, which vary according to these characteristics, has a general variable value between 1 and 5 t ha' year' of dry substance and is generally concentrated in the late spring-summer period with a restricted recovery in Autumn.

The characteristics of the grazing lands used are very heterogeneous. The animals use both surfaces with slight steepness or in plain, but can also adapt to grazing on very steep surfaces situated at high altimetre levels, not very practicable due to an abundance of stones or shrubs or arboreal plants.

In general, no feed supplements to grazing have been registered and, when present, these were only mineral salts, except in conditions of extreme drought when hay is provided.
Mountain area: semi-grazing system

• management on grazing lands during the good season
  Grazing period: May (June) - September (October/November)
  Grazing modality: free, moving to higher levels, according to the availability of forage
  Load: < 1 UBA ha⁻¹
  Grazing lands used:
  - spontaneous (prevalent) and natural: 1 and 5 t ha⁻¹ year⁻¹ of dry substance
  Food supplements when grazing: usually absent (only mineral salts)

• management in shed in the bad season
  Rationing according to the productive animal category:
  - production cows: hay, purchased feed and/or industrial flours
  - bulls: hay, purchased feed and/or industrial flours
  - heifers: hay, purchased feed and/or industrial flours
  - calves: purchased feed and/or industrial flours
  - lean cows: hay and straw (not always)
  - fattening animals: purchased feed and/or industrial flours, hay, straw (not always)

Shed management, used during the bad season in the semi-grazing system and all year round in the case of the stalled system, usually involves different feeding according to the productive animal categories. In the mountain areas there are mainly cow productions (close to delivery or suckling), bulls and lean cows and some heifers. Calves are only present for a restricted period during the year. In the stalled system there is usually a further category, that of fattening animals, and in some cases, there is also a restricted presence of this activity in companies with the semi-grazing system.

The daily average ration per animal in the shed is based on the use of hay with supplements based on purchased feed and/or industrial flours (mainly barley, corn and field beans/soya), used for production, heifers and bulls. The use of straw was registered in some cases as a feed supplement for lean cows. In the case of calf rationing, mainly based on purchased feed and, subsequently, on industrial flours, was registered only if they were delivered in the last phase of grazing (end of August-September).

In the mountain area, the constitution of forage supply (hay, grain, ensilage), to used to feed the cattle during the stalled period of the semi-grazing system and all year round in the case of stalled system, it mainly done through the cultivation of meadows (both spontaneous and artificial) and, to a smaller extent, with other micro-thermal herbaceous cultivations used for the production of grain and, in rarer situations, for the production of ensilaged forage.

The mowing of permanent multi-grass meadows, where used, is almost mainly carried out according to the most favourable situations from the productive perspective (valley area or generally plain areas) and in those where the mechanization of haymaking operations is feasible. Fertilizers are not
usually used in this management (except for the dejections released during grazing or the crumpling of ovine flocks) and a single mowing which allows the production of hay quantity that varies between 2 to 6 ha⁻¹ according to the pedoclimatic and orographic conditions. In conditions with a higher productive potential, also cultivations of rotation meadows (artificial), mainly monofiti ones have been registered, mostly with sainfoin and alfalfa, and polifiti (various mixtures). The remarkable diffusion of sainfoin is linked to the great rusticity and the greater resistance to cold conditions when compared to more common leguminous forage. The meadow with sainfoin makes it possible to obtain a high production with just one mowing in the late spring (3-4 t ha⁻¹ of hay) and to dedicate the fresh growth of grass of the subsequent period for grazing. The meadow with alfalfa is less present in the mountain environment due the great sensitivity to low temperature of these cultivations. Therefore, it is only present in places with more favourable thermal (lower level, exposed to the south), pedological and orographical conditions since these cultivation are mainly dedicated to haymaking.

Among the most used cultivations, the production of grain, barley and oat are the most diffused and capable of supplying the greatest productive levels (3-4 t ha⁻¹).

In the case of companies situated at lower levels and on more productive lands it has been registered that besides the above-mentioned grain cultivations, there are cultivations of field beans which reach the values of about 2 t ha⁻¹ of grain in the piedmont areas.

The production of ensilaged hay, even if not very diffused, is mostly exercised in the case of monofiti meadows with alfalfa, corresponding to the first and last mowing which present greater difficulties for proper haymaking. Other rare herbs can also be used, mostly polifiti and represented by mixtures of oats and vetch or by field beans and barley, and, in some case, polifiti meadows.

In the mountain area, the purchasing of feed supplements from outside the company is only registered in the case of the company with or without a restricted arable surface. In companies that are
mainly oriented towards the production of the cow-calf line the provisioning depends on the purchasing of forages (hay from alfalfa), straw and a limited quantity of feed. Companies with fattening activity purchase the greatest amounts of feed and/or grains (oats, corn and field beans/soya).

7.2.1 Difficulties and intervention priorities

In the mountain area, the difficulties for which priority interventions are defined, regard the necessity to implement the management of spontaneous meadowlands which would otherwise be abandoned, to introduce new cultivations with short cycle sowing in order to produce greater quantities of adequate quality and to identify the new techniques and methods that can be used to: safeguard the environment, reduce the management costs of breeding and improve the economic value of the productions.

Throughout the ages cattle breeding has been one of the main ways to exploit mountain territory (Boscaglia, 1920; Cordella e Lollini, 1988; Pulè, 1937). The strong crisis of breeding that occurred in the second half of the last century (Santilocchi e D'Ottavio, 2005) has brought about a general decrease in volume (D'Ottavio e Scotton, 2002; D'Ottavio et al., 2000) or the abandonment of pastoral practices in most parts of the mountain territory and as a result of the consistent environmental, agronomical and landscape changes have occurred in the pastures. Among these changes it is worth mentioning the diffused process of recolonization of shrubs and arboREAL vegetation of secondary origin or those which used to be cultivated. If, on the one hand, the presence of these processes, if well regulated and managed, may be advantageous where the land needs protection, on the other hand, they have reduced and still reduce pasturing surface and cause tangible and significant changes to environmental characteristics (less degree of specific biodiversity, more susceptibility to fire, landslides and erosive phenomena) and to the landscape of vast mountain area. Moreover, the degradation of pastures due to changes in floristic composition which favour species that are little liked or completely refused (such as the species of the Brachypodium kind) has caused decrease in the pastern value of the surface used for pasturing effecting their productive capacity. Grazing lands in which vegetation is simplified through the covering with grass types, mainly of the oligotrophic type, are becoming more common. These formations are often a phase of the evolutionary dynamics which tends towards the spontaneous re-establishment of shrub and forest coverings.

The management of vegetative dynamics seems to be necessary in order to dominate better the evolutionary processes depending on the different objectives of the balanced territorial planning and the use of meadow-grazing lands resources, which, besides having a fundamental environmental and landscape function, in some mountain sectors, still have a significant productive role (D'Ottavio e Scotton, 2002). In this context, the definition of the agronomic characteristics and the guidelines on the use of mountain grazing lands, to be based on adequate and specific research and experimentation experience (D'Ottavio et al., 2005a; D'Ottavio et al., 2005b), seems
to be strategic to produce an beneficial economic impact on agro-pastern companies and the maintenance of environmental features and the landscape of the territory. The planning of agro-pastern activities must include interventions to improve grazing lands (elimination of shrubbery and weed, overseedings, fertilisation), the planning of grazing to match the necessary volumes to the productivity of grazing lands, but also the improving of pastern infrastructures (roads of access, farmhouses, drinking trough and water supply lines) which in some cases are lacking or inadequate for the existent needs or in need of maintenance (D’Ottavio et al., 2001). The complexity of the law structure that regulates agro-forest-pastern activities in the mountains and the obvious inadequacy of these tools to face the changed socio-economic and environmental conditions, in some case, seem to worsen the already difficult management of the resources in these areas. Therefore, there is the necessity to identify the problematic aspects their application bring about, the conflicts on competence among the various bodies appointed for the planning and the supervision of the territory and the preparation of proposals to adjust laws. The availability of an adequate quantity of grass in the spring-summer period is natural complement for the forage supply for the breeding that takes place in the mountain areas. It follows that the possibility to introduce new cultivation with short cycle sowing, capable of producing big quantities of adequate quality, seems to be an important condition for the development of the sector. For this matter it will be necessary to evaluate the environmental trend, persistence and various modalities of forage usage (Carroni et al., 2000; Piano et al., 2004) with specific reference to the various environmental and managerial peculiarities of the extensive agro-pastern systems of the mountain areas. From the varied international point of view, diverse varieties chosen by the local populations may be used both to improve mountain pastures and to build oligofiti meadows in arable lands.

It has become a common belief that in Italy the possibility to farm in most underprivileged areas is mainly linked to the recovery of cattle breeding, since it can optimally valorise its restricted productive potentiality (Santilocchi et al., 2005). In Central Italy this affirmation is even more significant, given the high percentage of marginal areas, especially in high hill and mountain areas. In order for this occur, it is necessary to revisit breeding forms that were traditionally present in the areas, excluding a return to fixed stalling, which besides being inconvenient from an economic point of view, seems to be unable to ensure conditions for the well-being of animals which is essential to obtain products with high qualitative standards. It follows, that the most valid alternative solution seems to be linked to greater diffusion of the grazing or the semi-grazing breeding systems, in which animals are free to move and feed, for most of the year, on spontaneous pasture forage resources or purposely sowed. The rationing of the cattle with grazing methods is an essential presumption for this type of territory and for animal management, both for the socio-economical and the sanitary and environmental aspects.

In order to do this it is essential to have the greatest amount of agronomical, pastern and zootechnical information.
With this vision, as regards the specificities of the mountain territory, the possibility to introduce fattening techniques also based on the use of pasture is of particular interest. The adoption of this technique may be a valid alternative to traditional practices which fixed stalls or in some cases forms of free stalling, with consistent impacts as regards reducing management costs, improving the conditions of animal well-being and sanitary aspects, and the adding value to the productions with identifiable characteristics.

For the agronomic rehabilitation for productive and preservation purposes of territory surfaces, in which agriculture activities have abandoned in marginal mountain areas, there are no alternative economic activities other than extensive breeding. In this context, it becomes important to verify the possibility to strengthen the cow-calf line production system to be based on the use of abandoned or marginally situated pastures at various altimetry levels for the production of fattening animals. Verifications must regard the agronomic, pastern and zootechnical aspects even in terms of production costs, managerial and logistic aspects which they require.

In the area which have experienced progressive depopulation and the abandonment of pastern activities over the last ten years, there have been repercussions also on the socio-economic and cultural conditions (employment, income and quality of life). Nevertheless, in other areas, some enterprises gained ground and managed remain vital notwithstanding the deep crisis in the agricultural sector and that merit to be analyzed and valorised through specific interventions. These forms of development have brought about the diversification of the productive sector, the restructuring of companies in various forms of co-associations (consortia, cooperatives), new initiatives to sustain the quality of the offer (protection brands, certification) or of marketing (Slow Food protection, participation in international and national exhibitions and fairs) and the strengthening of processing procedures and the direct selling of products (e.g. tourist farm-houses).

For over ten years, the agronomical research on agro-pastern systems at the international level has undergone new developments, also based on new production theories and the integration of scientific know-how in complex situations (Pearson & Ison, 1997; Ison & Russell, 2000). According to these theories, the agro-pastern systems may be considered not only as a set of bio-physical elements and processes that regulate relations between input and output matter and energy, but also as learning systems, in which the processes of know-how communication between the stakeholders assume a key role in the sharing of difficulties and development strategies. In this context, the integration of scientific knowledge for sustainable development implies participative and adequate approaches which facilitate dialogue among subjects with conflict of interests as regards the use of resources (Roggero et al., 2006).

7.2.2 The case study of Macereto

With the objective of analysing the effect of agro-pastern management on the evolution of mountain grazing lands, the Department of environmental Science and of vegetal Production in the
Polytechnic University of the Marche is carrying out specific research on the territory of Macerata (MC) coordinated by Prof. Pier Paolo Roggero.

**Characteristics of the study area and the survey methods used**

The study area is characterised by the presence of secondary grazing land with differentiated management. A consistent part of these areas belongs to the commune, which is destined for common usage by those who have the right to it, and whose surface is private property. Research included the diachronic study of vegetation throughout the last five years with the interpretation of orthophoto, the analysis of the evolution of managerial characteristics, the analysis of the vegetation and the agronomical analysis for the quantification of pastoral value in the secondary grazing lands being studied.

**Summary of the main results of the survey**

The analysis results, still in the publication phase, point out how, in the case of communal surfaces, the abandonment of sowable lands has made way for progressive spontaneous vegetation used for animal grazing. As time went by, lack of maintenance and the decrease of grazing animals led to less free grazing surfaces favouring surfaces covered with shrubbery (mainly juniper and red and pink canina).

The substitution of sowable land with surfaces for grazing (artificial meadow-grazing lands and spontaneous grazing lands) has also been registered on private surfaces which, unlike public surfaces, have progressively increased throughout the years and are kept free from shrubbery due to periodic cultivations, the grazing and the cutting of shrubs.

The agronomical analysis of the grazing land has pointed out that pastern value decreases remarkably with the increase of surface with shrubs and that in surfaces free from shrubbery it is almost equal to that of cultivated areas (private) and uncultivated ones (communal). In addition, the analysis of the pastoral value calculated on herbaceous vegetation, has confirmed inferior values in the case of meadow crowded with shrubbery; moreover, it has shown inferior values for cultivated areas with respect to uncultivated ones or, at the most, remarkable uniformity due to the difficulty to keep herbaceous covering for a long-term and adequately rich of natural palatability species.

On public surfaces, the present reduced loads and the lack of shrub elimination, due to the scarce will to invest on surfaces since breeders do not have full rights on the property, make long-term preservation of grazing lands difficult.

Nevertheless, the results of the analysis on the pastern value carried out on private surfaces show that the cultivation of land, after having cut the shrubs, is often useless and harmful. It is almost always preferable to substitute this practice with suitable interventions for the improvement of herbaceous covering, amongst which manuring and/or overseedings (Santilocchi & D'Ottavio, 2004).
7.3 L'area di alta-media collina

In the high-medium area, the breeding of the Marchigiana breed is mainly done through the stalled system and, to a lesser extent, using the semi-grazing one. The stalled system is often used for fattening of calves produced in the company, especially when there is enough availability of surfaces to be used for the production of forage and grain for zootechnical use. The greater diffusion of the stalled system is linked to the pedo-climatic factors as well as the socio-economic reasons. The better conditions of the hill area lead to greater productive potentiality of the agricultural lands most of which are cultivated for the production of microtherm cereals (mainly oats and barley) and rotated forage (mainly alfalfa). In this context the presence of breeding activity, mainly oriented towards fattening, is traditionally linked to its possibility to add to the companies' income, especially after animals were no longer used as work force. In the light of this, the adoption of a stalled system in these areas has always been the best way to maximize zootechnical productions and use as much as possible of the surface for cultivation at the same time.

Presently, due to the number of unfavourable aspects contingent to the breeding according to traditional practices (increase of management costs, difficulty to find work force, the age of the manager, law restrictions and unfavourable market conditions), the cattle sector in these areas are aiming at introducing new techniques and methods to reduce the management costs and to improve the economic value of the productions. In particular, many of the traditional stalled breedings are moving towards the more extensive semi-breeding forms (Santilocchi et al., 2005). On the one hand there is stalled breeding, which entails grazing on grazing lands and artificial meadows-grazing lands on the companies' land, is gaining ground. While, on the other hand, there are companies who practice vertical transhumance.

Likewise, for the mountain areas, shed management, carried out all year round in the case of the
stalled system and the bad seasons in the semi-grazing system, a different kind of feeding is used depending on the productive category of the animals. In the hill area, there are mainly production cows, lean cows and, subsequently, heifers and bulls. The fattening animals are calves and bullocks according to the different level of development. In the case of calves, feeding is based on industrial flours and purchased feed administered ad libitum with a limited ratio of long fibre (straw and/or hay); while bullocks are given industrial flours and/or purchased feed, hay and, eventually straw. In the rare cases of particularly intensive breeding unifeed is administered to production cows and bullocks.

In the semi-grazing system, where vertical transhumance is used in the mountain areas, grazing is carried out according to the typical modalities that have already been described and adopted in that context. In the case of stalled breeding, grazing is carried out on grazing lands and artificial meadows-grazing lands in the areas close to the company or, in some cases, on spontaneous pastures. In these cases the grazing period usually last from June to September. Grazing is started so late because of the strong clayey component in the land, which makes it very difficult to graze on very wet land. It is only in the case of good pedological conditions that grazing is anticipated to May and its conclusion can be postponed until November. The most diffused grazing method is free grazing on grazing lands that are fenced and, in some cases, according to rotation for which the grazing land is further divided into sectors that are progressively used during the grazing season. Usually, supplementary feed (hay and mineral salts) are used together with grazing during the summer period when extreme drought conditions occur and when the production of pastures especially meadows-grazing lands decrease consistently. After the summer slackness, there is usually a recovery in grazing at the beginning of autumn before animals return to the shed. Bigger volumes values registered for the mountain area (usually between 1 and 2 UBA ha\(^{-1}\)) are attributed to the better orography of the grazed surfaces as well as the high productivity of the grazing lands which, in the case of artificial covering may even reach values higher than 10 t ha\(^{-1}\) year\(^{-1}\) of dry substance.
High-Medium hill Area: semi-grazing system

- management of the grazing lands in good season
  
  Grazing period: May (June) - September (October/November)
  
  Grazing modality: free and with rotation
  
  Volume: 1-2 UBA ha\(^{-1}\)
  
  Grazing land used:
  
  - artificial (prevailent) and spontaneous: 2 - 10 t ha\(^{-1}\) year\(^{-1}\) of dry substance
  
  Feed supplements during the grazing: usually present (hay and mineral salts)

- management in shed in the bad season

  Rationing according to the animal productivity:
  
  - production cows: hay, industrial flours, unifeed (rarely)
  - bulls: hay, purchased feed and/or industrial flours
  - heifers: hay, industrial flours
  - calf: industrial flours and/or purchased feed
  - bullocks: industrial flours and/or purchase feed, hay and straw (not always), unifeed (rarely)
  - lean cows: hay and straw (not always)

In the high and medium hill areas, the composition of the forage stock (hay, grain, ensilage) is obtained through the use of various cultivation. Hay is obtained from artificial meadows, mainly alfalfa, for which a total of 2-3 cuttings are carried out from which a variable quantity between 7 and 9 t ha\(^{-1}\) is obtained depending on the pedoclimatic and orographic conditions. In some cases, hay is also produced in artificial polifiti meadows-grazing lands (based on various grasses and clover) which are cut only once in the spring phase which, in favourable conditions, consents the production of up to a quantity of 5 t ha\(^{-1}\) of hay. Among the most used cultivations for the production of grain, barley and field beans are definitely the most diffused and are capable of providing the best productive levels (4-5 and 2.5-3 t ha\(^{-1}\), respectively). There is a restricted production, which is still present in some rare cases, of sweetcorn ensilage (dry cultivations), preserved in trenches; likewise in mountainous area there is the production of ensilage-hay for monofiti meadows of alfalfa (corresponding to the first and last cutting) and for rarer meadows, mostly polifiti, represented by a mixtures of oats and vetch or field beans and barley.
High-Medium hill: cultivations for the production of forage stock

- **Hay**
  - artificial meadows with alfalfa (*Medicago sativa*): prevalent
  - artificial meadow-grazing land with grasses and clover: in some cases

- **Grain**
  - barley (*Hordeum vulgare*)
  - field beans (*Vicia faba var. minor*)

- **Ensilage and ensilaged hay**: not common
  - sweetcorn: in some cases
  - meadows of alfalfa: 1st and last cutting
  - meadow of oats + vetch (*Vicia sp.*)
  - meadow of field beans + barley

In the high and medium hills, the external purchasing of feed supplements is limited or absent due to the great availability of sowable lands with high productive potentiality and which are usually used by the breeding companies. In the case of external supplying, mainly sweetcorn and broomcorn, and to a lesser extent soya, are purchased. In the case of particularly unfavourable haymaking trends, hay stocks are also bought.

### 7.3.1 The difficulties and the intervention priorities

Due to the many adverse aspects that have been registered in traditional breeding in the high and medium hill, also the cattle sector in these areas is moving towards the introduction of new techniques and methods to reduce management costs and to improve the economic value of the productions. (Santilocchi et al., 2005).

From this perspective, rationalization in cattle breeding using the stalled type must include, as regards the adjustment processes of the laws in force, the adoption of interventions that aim at reaching the stated objectives. In this regard, free stalling forms must be identified and adopted which, where possible, need eternal paddocks and more fencing, so as to increase the conditions of the wellbeing of animals and reduce the costs with the elimination of dejections. Further interventions may concern the application of actions to reduce the management costs of feeding through the automation and the improvement of the forage system.

Nevertheless, in many cases the objective difficulties to adapt the various small traditional sheds create problems for the introduction of above-mentioned techniques and methods.

As it has already be pointed out for the mountain area, also in this case, rationalization of free cattle breeding (grazing or semi-grazing system) necessitates preparing detailed information, with particular reference to the following points:

- the breeding system and the most convenient grazing modality, as regards the environment in which the work is to be done and the type of animals being bred;
- adaptation or re-adaptation modalities of the animals to grazing and outdoor life;
• the most important forage species and the forage mixtures to be used in the formation of grazing lands and artificial meadow-grazing lands in the various environments;
• techniques for the management of the areas and the pastures;
• the most rational cultivation and preservation technique for the production of feed stock.

On the basis of the pedo-climatic characteristics of the area, animals in free breeding systems stay on pastures for a longer period, with the aim of reducing feeding costs and improve animals’ health conditions. For this purpose, studies must be carried out on how to form grazing surfaces with a certain consistency and persistence, where the animals graze throughout the crop season, using hay supplies only in periods of lack of grass production due to drought in summer. Specific research must be done to define the most suitable grazing methods for the available areas so as to exploit their potentiality and to use them in the most efficacy manner. The introduction of rotation grazing, with respect to free grazing, may lead to a more efficient use of the grass coverings, ensuring an adequate period of re-growth for the most productive plants maximising their potential production and maintaining high quality forage availability during the grazing season. Moreover, it will be necessary to proceed with the definition of the main factors of pastern management, such as animal volume and the choice of fixed field structures (fencing and drinking troughs) to be set up for the various types of grazing.

An aspect that needs to be looked into is the study and the definition of adaptation or re-adaptationmodalities of grazing animals and outdoor life since knowledge in this regard can no longer be taken for guaranteed.

An important aspect concerns the choice of forage and mixture species to use in the mixtures for the reconstruction of grazing lands and artificial meadows-grazing lands. This may be carried out on the basis of the pedo-climatic characteristics of the area where the grazing cultivations are to be introduces and the animals that will use them. Therefore, the choice of these factors should also consider the morphological-physiological characteristics and the mechanisms of adaptation and/or resistance to grazing in various species, the aspects of grass covering productivity, the seasonal distribution of production, the evolution of the floral composition, the palatability of the various forage mixtures planted and the single species. Moreover, the choice of species must be based on the consideration that the way animals respond to the variations in grazing land characteristics also depends on the type of management.

Specific analysis will have the objective of studying and applying various interventions to improve cultivations on pastures. These may include precaution when managing degraded grass covering and the fight against the diffusion of undesired and/or infesting species. In view of a biological zootechnical production, studies and experimental interventions for the intensification of cultivations compatible with the laws in force may also be carried out.

Another managerial and organisational aspect that must be followed, bearing in mind the present situation, must be that of achieving, as far as possible, self-sufficient feeding. In order to do this, it is important to dedicate part of the company, not used for grazing, for the production of forage...
and grain necessary for the integration of the feed ration. It may be interesting to evaluate both new
cultivations for the production of grain and new solutions for the production of ensilage. For the
former aspect, it might be interesting to reuse triticale in high hill area, given that is productive
potentiality is greater than that of barley. In the case of grains for field beans, it is worth evaluat-
ing the possibility to use a variety of light seeds, which is more digestible since it contains no tan-
nins, while other species, such as the garden pea, may also be used. As for the production of ensi-
lage it might be interesting to evaluate the characteristics of other species, which in these condi-
tions, definitely have higher productive potentiality than sweetcorn, for example the autumn or win-
ter cereals and even broomcorn.

As for the production of forage, besides making the most rational choices as regards the species
to be used, it will be essential to set up various systems to preserve the forage, so as to reduce
losses and to improve the quality of forage.

Other surveys, mainly conducted in collaboration with zootechnical and veterinary researcher, may
tackle the impact that pastern management has on animals’ health conditions and weight gain. With
respect to a stalled breeding system, the use of grazing in a zootechnical company entails commit-
ments and management complications. Among these, there might be problems regarding the bal-
ancing and the integration of animals’ diet due to a forage offer that varies in quantity and quality
during the grazing period which may cause reproductive difficulties in animals if their metabolic
needs are not satisfied with an adequately balanced diet. In this way, controlling the quality of for-
age during the grazing period may also allow the calculation of nutritional supply of the daily ration
and to decide whether to turn to supplementary feeding based on an objective evaluation of the ani-
mals’ needs.

7.3.2 Trial on the farm “Putido” in the Commune of Fabriano

With the objective of obtaining knowledge which can be used for the rationing of free grazing
breeding, the Agronomy and Herbaceous Productions section of the Department of environmen-
tal Science and Vegetal Productions of the Polytechnic University of the Marche has, as from
2003, conducted experimental activities on the farm “Putido” in the commune of Fabriano (AN)
with the coordination of Prof. Rodolfo Santilocchi.

The experimental activities were carried out between 2003 and 2005 within the project
“Requalification of semi-grazing Marchigiana cattle breeding on hills and mountains with the
rationalization of grazing systems and the forage mixtures used” financed by the Marche Region
(Regional Law no. 37/99); from 2007 to 2008 within the project Interreg “Marcbal: The
Marchigiana Cattle breed in the Western Balkans. A project for cross-border cooperation and
sustainable development”.

In detail, the experiment had the objective of obtaining information regarding aspects and diffi-
culties when adopting rotation grazing for semi-grazing breeding of the Marchigiana breed in the
high-hill areas of the province of Ancona.
Characteristics of the study area and survey methods applied

The experiment was conducted on surfaces with variable morphology and inclinations at an average altitude of about 500 m a.s.l. and characterised by the presence of clayey grounds. The study area has an average annual temperature of 12.6 °C and an average annual rainfall of 945 mm. The tests were carried out pastures sowed in mid April 2003 with a mixture of Festuca arundinacea (25%), Dactylis glomerata (15%), Lolium perenne (25%), Lotus corniculatus (15 %), Trifolium repens (10%) and Medicago sativa (10%), with a 50 kg ha\(^{-1}\) dose.

As from the spring period 2004, the grazing surface of about 19 ha was sub-divided into grazing sectors, each with electric fencing and equipped with 2 mobile troughs. The herd used for the grazing was made up of about 20 cows and 10 calves of the Marchigiana breed for a grazing period that lasted from mid May to the first ten days of September. Some sectors were used as meadow-grazing lands, where haymaking took place around 20th May.

During the entire grazing period, the production of dry substance from the pasture was calculated for each sector, based on samples from every sample area before animals were introduced and when they were taken out, so as to calculate the quantity of forage which was not grazed. The samples were used to calculate the contribution of every botanic family in producing dry substance.

Summary of the main results of the experiment

The productive results have show that the most favourable period for forage production was, as expected, spring, while in summer there was only a modest increase (D’Ottavio e Santilocchi, 2007). This kind of productive trend conditioned the management modalities applied. Increase in the production of dry substances, which occur during the grazing period in every sector, seem to be high until the first ten days of July and were more or less insignificant in the subsequent periods given the limited growth pace of the grass. In the first cycle, in all the sectors, a consistent quantity of forage is present, often higher than what is usually considered to the optimum for pastures. The clayey nature of the experiment grounds, which are similar to those of the medium hill areas of the Marche, presents the necessity to delay grazing according to the productive trend of the pastures, so as to prevent excessive damage caused by trampling which has negative repercussions on the ground structure and the duration of grass covering. In the subsequent grazing cycles, there were consistent falls in forage production (up to 90% with respect to the first cycle) due to lack of water in summer.

The high forage production that was obtained in spring imposes the dedication of a part of the surface with forage as meadow-grazing land and, therefore, a first cutting for the production of hay is carried out in spring. The need to eliminate or restrict forage waste due to abundant production, with a high presence of weeds with an advanced earing state, has led to increase the surface used for haymaking during the years of experimentation. On the one hand the greater production of hay obtained entailed amply reaching self-sufficiency for the foraging of animals, while, on the other hand, it brought about a decrease in the production of grass to be used dur-
ing the grazing period and, therefore, the need to forage with hay on pastures and to use other external surfaces to increase the quantity of forage for grazing during the summer period. Moreover, the productive trend has conditioned the duration of the grazing cycles with strong repercussions on management. The large surface submitted to cutting has, in some case even in a significant manner, caused a reduction in the length of the first cycle of usage. The use of the above-mentioned external sectors in summer has longer duration of the second cycle. In order to reduce commitments in the management of the herd in the very short cycles that follow the first grazing, during the years of the experiment, the number of grazing sectors was reduces and the extension of each of them was increased. This practice has shown to be able to determine managerial advantages and lower costs given the less frequent moving of the herd. Moreover, there is the risk of mitigate the advantages linked to animals’ health produced by the rotation grazing modality with short cycles (less than 10-12 days). In fact, the adoption of short cycle makes it possible to avoid the coincidence of the biological cycle of parasites that are normally present in the animals’ faeces and the presence of the animals themselves in a sector, reducing the potential harmful effect on the grazing animals. An “aid fencing” used for the foraging of animals was set up to safeguard the grass covering. The application of this precaution allows easy foraging during the suspension of the grazing period, avoiding grazing on consumed pastures (especially in the summer period) and reducing damages to the covering during prolonged raining periods.

Besides the early difficulties in herd management mainly due to habitual behaviour, throughout the entire grazing season to particular inconveniences were reported. In fact, the animals have shown excellent adaptation both to the periodical moving to the various grazing sectors and the mobile structures used for the management of the grazing (electrical mobile fencing and troughs). For this purpose, it has been found that the setting up of electrical mobile fencing is particularly efficient, showing, contrary to was is commonly believed, adaptability of the Marchigiana cattle breed to be managed on pastures even with this cheap and versatile system of fencing the sectors. In addition, the use of drinking troughs has been found to be efficient. Their positioning in different areas of each grazing sector, avoided and reduced the intensity of the negative effects caused by the continuous approaching and the standing of animals on the same surfaces. According to the observations that have been made for the entire grazing season, animals have shown that they prefer, especially in the hottest hours of the day, the ridge areas and the areas near the drinking troughs and to move towards the slopes in other moments of the day. The sectors situated along the curves at a level, has therefore shown to be a good management system since it ensured their presence in all every sector of the pastures and impeded overgrazing and/or undergrazing on the various surfaces of every sector. Anticipation and prolongation of the grazing period in those sectors with species that are not particular pleasant or almost completely refused by the animals or even relatively wide areas that are
almost completely dominated by the *Agropyron repens* seem to have caused a drastic reduction (in the case of the species) and a wider use (especially in the case of *Agropyron repens*). In addition cutting interventions have reduced the quantity of infestants that are completely refused by the animals.

The drawing up of the economic budget has shown how the traditional system, based on the adoption of free grazing, has had higher management costs with the introduction of rotation grazing, almost totally due to the greater quantity of hay used for foraging.

Among the most important difficulties which need further surveying is the duration of grass covering. Specific research must be carried to study the evolution of the floristic composition, that has productive characteristics for pastures and the maintenance of the productive level of the surfaces used as meadows-grazing lands. In the case of grazing surfaces, in will therefore be necessary to evaluate the multiple effects of grazing on the characteristics of the ground (trampling damages, variations in fertility, etc.). Unlike in grazing lands, the cutting and the removal of grass in the meadow-grazing lands brings about a lack of restoration of the nutritional elements absorbed by plants. Generally, this intervention causes consistent effects on the variation of the floristic composition and the productivity of the covering that, on a first analysis, can justify the productive decrements observed over the years of experimentation, sometimes even when climatic conditions were favourable. Obviously, this condition was particularly accentuated by the company’s choice to practice biological agriculture and not to use manuring. Therefore, for the sustainable productivity of the meadow-grazing land surfaces it is necessary to maintain fertility through adequate manuring interventions, even organic, which restore the amounts of nutrients that had been removed.

Moreover, other studies need to be carried out on the expeditious systems that are easy to apply to plan rational and efficient forage usage.

Moreover specific analysis may be conducted on the study and application of various interventions for the improvement of pastures. They may be overseeding interventions, precautions for the management of degraded grass covering and the fight against the spreading of undesired and/or infestant species such as *Agropyron repens*, which was particularly abundant and aggressive in the study area. The adoption of high instantaneous volumes and the anticipation of grazing used to restrict its diffusion seems to have produced it greater use, but at the same time it leads to consider medium-long period effects on the evolution and the quality of the floristic composition which may result from these practices.

Moreover, other experimental activities regarding the adaptability of various types of mixtures may be of great interest, even when characterised by differentiated growth paces during the vegetative season, and on more favourable grazing lands (less clay and a moderate skeleton presence), so as to verify the possibility of enlarging the grazing period.
Besides the aspects closely linked to forage, further studies may tackle zootechnical aspects. Given the possibility to separate the herd for different modalities of grazing even during the winter period, specific studies may be conducted to evaluate the impacts (productive characteristics, health conditions) caused by the different management. Moreover, specific surveys, may regard the possibility to wean calves in different times depending on the subjects' weight, so as to better verify any impact on their subsequent growth pace and on the possibility to anticipate cows' heats.

The checking of forage quality during the entire grazing period has made it possible to evaluate the nutritional supply of the daily ration and to decide which type of supplementary feeding is to be used based on an objective evaluation of the animals' needs. In this context, the in-depth studies of the various fibre components of the forage will be useful to better calculate the quality and the digestibility of the forage given to the animals. An improvement to the forage budget presented may be carried out by comparing the energy used with ingestion capacity of the various animals.

As a last analysis, given the importance that the well-being and the socialization of the animals has in biological zootechnical production, it may be of particular interest to evaluate the behaviour of the animals while grazing.

7.4 The low hill area and the plain

In the hill area and the plain, the breeding of the Marchigiana breed is exclusively of the stalled system type. In these areas breeding is mainly aimed at the fattening of calves which, depending on the structural and organizational characteristics of the company, may be produced in the company or bought for breedings with the cow-calf line. Besides this productive orientation, where the degree of specialization allows it, cattle breeding also follows an animal production with high genetic value, creating added-value for the company.

In these areas, with high sowable productive potentiality, often used for the production of cultivation with high income such as horticulture, the exclusive use of the stalled system by zootechnical companies for the production of meat, there are limited surfaces that can be used for animals' feeding needs. In any case, the income from such a zootechnical breeding can be guaranteed, above all, with the direct selling of meat.

In some companies, that are getting ready for the fattening of calves produced in the company, there is a tendency to build paddocks or fencing (usually, made of plants used in pastures) more or less spread and localized in the areas close to companies, with the aim of hosting lean cows, production cows and their calves and the heifers, reducing the costs and the commitments for their management.
As it has been observed for all the breeding areas, also in this case stalled management involves a different type of feeding depending on the productive category of the animals. In comparison with the hill area, there is a greater use of unified, given the greater availability of ensilage, mainly sweet-corn and ryegrass, and flours prepared from grain produced in companies.

### Low hill area and plain: stalled system

- **management in shed all year round**

  **Rationing according to the productive category of the animals:**
  - production cows: hay, industrial flours, unifeed
  - bulls: hay, purchased feed and/or industrial flours
  - heifers: hay, industrial flours
  - calves: industrial flours and/or purchased feed
  - bullocks: industrial flours and/or purchased feed, hay and straw (not always), unifeed
  - lean cows: hay and straw (not always)

In the low hill areas and the plain, the production of hay is mainly obtained from artificial meadows of alfalfa, which are usually cut 3-4 times producing a quantity of hay that varies between 9 and 10 t ha\(^{-1}\). In extremely favourable cases and in those irrigation is allowed, up to 6-7 cuttings are carried out to produce up to 15 t ha\(^{-1}\) of hay. In some cases there has been the production of dry hay, or ensilage hay, or ryegrass (6-7 t ha\(^{-1}\) of dry substance). Among the mainly cultivations used for the production of grain, besides barley (6 t ha\(^{-1}\)), there are those capable of providing high productive levels such as well-watered sweetcorn cultivations (10-13 t ha\(^{-1}\)). Lately, there has been a certain interest in cultivation within sweetcorn zootechnic companies, situated in the plain, and with a more consolidated productivity of garden pea mainly on the hills, necessary for the protein integration of feed rations. In the case of these companies, the production of sweetcorn and ryegrass ensilage, preserved in trenches, are very diffused.
Low hill area and plain: cultivations used for the production of forage stock

- **Hay**
  - artificial meadows:
  - alfalfa (*Medicago sativa*): prevalent
  - ryegrass (*Lolium multiflorum*): in some cases

- **Grain**
  - barley (*Hordeum vulgare*)
  - sweetcorn (*Zea mays*)
  - soya (*Glycine max*): in some cases in the plain area
  - garden pea (*Pisum sativum*): mainly in the hill area

- **Ensilage**
  - sweetcorn
  - ryegrass: in some ensilage-hay cases

In the low hill area and the plain, the purchasing of supplementary feed from outside the company is restricted or absent given the great availability of sowable lands with high productive potentiality and also due to the high level of intensification of cultivations which companies with breeding usually have. In the case of external supplying, usually protein grains (mainly soya and also field beans and peas) are bought. In the case of particularly unfavourable trends in haymaking, hay supplies are also purchased. Up to a recent past, there have been external supplying of dry and humid pulp of sugar beet (in this case used for the integration of ensilage), which significantly contributes to the integration of feed for cattle with intensive breeding systems.

### 7.4.1 Difficulties and intervention priorities

A fundamental managerial and organisational aspect of breeding in the low hill and plain areas is achievement of the company’s self-sufficiency in feed. In order to do this it is necessary to maximise the production of forage and grain necessary for the integration of feed rations.

As for the production of forage, besides making the most ration decisions as regards the species, the variety and the mixtures to be used, it will be essential to choose the systems for the preservation of forage, so as to have fewer losses and better quality of forage. In particular, attention must be given upon the first cutting, since it is definitely the most abundant one, but also subject to very high loss percentages. Methods of conditioning, to acceleration the desiccation of grass, and of preserving semi-dry forage must be planned, even to anticipate this intervention and to renders later cutting more certain. Similar consideration are also valid for the last cutting since the conditions of drying (shorter days and solar irrigation and higher degrees of air humidity), make haymaking operation more difficulty.

In the case of the production of grains, it will be interesting to verify the possibility to introduce
new variety of soya with low contents of anti-nutritional factors such as protein integration to be used directly without toasting.

7.4.2 Testing on the forage used for intensive breeding

Numerous experiments have been made on the commonest types of forage plants used for the feeding of cattle bred with the intensive system, both at national and international level. Among the plants most used for this purpose are the alfalfa and the sweetcorn. For these and for many other cultivations used for this purpose (soya, monofiti and polifiti meadows) the productive characteristics and the trend in different environments and conditions have been described in detailed and the impact of various cultivation techniques that aim at optimizing their cultivation have been verified. For these reasons, it was considered that it is not appropriate to report the results of the experiment which, even if numerous and use various techniques, have been carried out and are still progress within the context of the Marche Region and in the didactic-experimental company “P. Rosati” of the Polytechnic University of the Marche. For consultation refer to the vast bibliography produced by Prof. Santilocchi on this issue over the years.

7.5 Conclusive considerations

The various problems that regard cattle breeding in general, and therefore even the Marchigiana breed, can be mainly traced back to the increase in management costs, in particular those of feeding, the difficulty to find work force, the more and more restrictive provisions and the unfavourable market conditions.

Upon facing this contingent situation, there is a different evolution in the breeding systems when compared to the traditional one present on their territory of diffusion. If, on the one hand, there is an abandonment of smaller breedings, especially the closing down of activities due to the farmers’ average old age, and that of breeding being a more or less marginal activity on farms, on the other hand, their specialization has been registered. The latter trend seems to occur in all the areas of diffusion with different modalities. In the mountain area and the inner hill areas most of the traditional stalled breedings are moving towards more extensive forms, including the strengthen of the semi-grazing system, the intention to adopt fattening techniques even based on grazing and increasing the economic value of the company’s productions. In the littoral hill area and the plains, specialization tends to maximise incomes through zootechnical activity which, in some cases, is organised or is getting organized for the fattening of calves produced in the company itself and the adoption of breeding forms linked to cost reduction and the commitment towards their management. In both the above-mentioned areas, specialization often includes the possibility to valorise one’s own production using quality systems (retraceability, brand acknowledgment, the issuing of certificates).

Given the problems and the priorities for intervention registered in the various territorial con-
texts, the research and the experiment regarding forage will have the role of analysing and evaluating various aspects.
Specifically, in the mountain area, it will be necessary to define the possibility of implementing field management forms alternative to abandonment, the possibility to introduce new cultivation with short cycles on sowable lands which can produce greater quantities of suitable quality and the identification of new techniques and methods for the safeguarding of the environment, the reduction of management costs for breeding and for a better economic valorisation of the productions.
In the inner hills, specific in-depth studies are necessary as regards the rationalization of free cattle breeding (grazing and semi-grazing system) to back the tendency to adopt more extensive forms of breeding.
In the case of littoral hill and plain areas, besides making the most rational choice as regards species, varieties and mixtures to use for the constitution of meadows, it will be essential to plan forage preservation systems, so as to reduce losses and to improve the quality of forage. In the case of the production of grains, there has been the interesting introduction of the new varieties of soya with low content of alkaloid toxics as a protein integration to be used directly without toasting.
Bibliography

- Puliè G. (1937); “La pastorizia transumante nell’Appennino Umbro-Marchigiano”. L’Universo. Year XVIII. No. 4-5. April-May 1937-XV.
- Santilocchi R., D’Ottavio P. (2005); “The evolution of cattle and sheep breeding systems in Central Italy over the past two centuries”. EAAP Publication No. 115: 15-18.
When speaking of beef production, the Marchigiana cattle breed can claim excellent qualitative-quantitative characteristics.

The quantitative evaluation of cattle beef production is based on:
- weight at birth;
- weight during weaning;
- FCI - Food Conversion Index (ratio of food supplied and weight gain);
- weight at slaughtering;
- slaughtering output (ratio of carcass weight and manure weight);
- meat weight (ratio of carcass weight and boned meat weight).

At present, the adult cattle of the Marchigiana breed can reach the weight of 12-15 quintals, while the female reaches 7-9 quintals.

The slaughtering output is around 63% to 67%. The average daily growth can reach 2 Kg. The ideal weight for slaughtering is reached at about 15-16 months, with up to 67% yield given
the fineness of the skeletal structure and the skin favouring a better slaughtering output. The bullock reaches the right percentage of marbling fat around 18-24 months, therefore, at the age when upon slaughtering the characteristics of the meat are at their best. During the last ten years the Marchigiana has shown an increase of AMG equal to 100g/day both in performance and pre-performance. Muscularity passed from 355 to 387 points, with an average increase of more than 3 point per year. The weight at 365 days has an immediate weight of about 40 kg, exceeding 550 kg.

In recent years, the increasing attention of the consumers towards safer and healthier food has brought about an increase in the consumption of quality meats and, as a result, the re-appraisal of rustic races which, being more suitable for feeding on pastures, offer meat of significant qualitative interest. The Marchigiana breed is one of those highly valued autochthonous breeds that, given their versatility, can exploit more extensive breeding systems and give productions with interesting organoleptic characteristics, appreciated in Italy as well as abroad.

8.1 Quality of the carcass and its classification

There are regulations on the quality of cattle carcass that establish which objective quality parameters must be taken into consideration. The judgement of the cattle carcass is carried out in compliance of some EC Reg (Reg. 1808/81, Reg. 1186/90 and 1026/9 and subsequent modifications and integrations). The cattle carcasses are first classified by category, divided into five classes (A,B,C,D,E) according to gender (male, female or castrated) and the animal’s age and, subsequently, they are given a score of conformity expressed in letters (S-E-U-R-O-P), with decreasing muscularity from S to P and, above all, adiposity (1-2-3-4-5), with increasing fat covering from 1 to 5. These are the important product parameters since they regulate and standardized the trading relations between breeders and merchants, with reference to objective quality parameters. The information contained in the SEUROP judgement of the carcass, even if not always reported on the end product, provides important indications on the quality of fresh meat. For example, the quality of the carcass obtained from animals of beef breeds belonging to PGI “White Bullock of the Central Apennines” belong to the R-3 typology (animals with an average structure and the correct adipose covering), that is, which provides cuts in the quantity and quality that satisfies both the butcher in the preparation phase and the consumer, given the low values of intramuscular fat.

8.1.1 The main cuts of the cattle meat

1) Thick Skirt (Lombata) the back part of the cut, it has the six lumbar vertebrae as its bone base and the tenderloin is situated within it. It can be sold with or without the bone.  
2) Rib (Costata) is the front part of the thick skirt and has the thoracic vertebrae.
3) **Tenderloin (Filetto)** most of its length is situated under the lumbar vertebrae. It can be detached as a whole or left with the thick skirt (steak with tenderloin). For the latter case, the part of the tenderloin that lies outside the thick skirt and continuous up to the thigh is sold separately.

4) **Loin (Fesa)** it is taken from the internal side of the thigh. It has long and thin muscular fibre, and therefore particularly tender. Moreover, it has little permeation fat.

Other Italian names: scannello, natica, rosa

5) **Thick Flank (Noce)** taken from the front part of the thigh (external side) attached to the femur. It is sold together with the flank, flat cut with a triangular shape which has a muscular tissue with a thick grain, and so it is not as tender as the loin.

Other Italian names: rosetta, tracoscio, sottocoscio, bocci a grande, bordone

6) **Rump (Scamone)** is the part that joins the thick skirt with the thigh. It has no permeation fat.

7) **Topside (Sottofesa)** is the lateral hind part of the thigh and has a rectangular shape.

Other Italian names: lucertolo, controgirello, culata, dietro coscia, fetta di mezzo

8) **Eye of Thick Flank (Girello)**, it is taken from the hind part of the thigh. It is made of a single muscle, it is round, compact, very lean but with thick fibre and so it is rather tough compared to other cuts.

9) **Topside cap (Campanello)**, it is a cut from the hind leg that corresponds to that of the human calf. It is rich in connective lamina.

Other Italian names: collo del campanello, muscolo posteriore, pesce, piccione

10) **Hind Shank (Muscolo Posteriore)**, taken from the hind leg, its muscles are small and rich of connective parts.

11) **Fore Shank (Muscolo Anteriore)**, taken from the front leg, its muscles are small and rich of connective tissue.

Altre denominazioni: gamba anteriore, geretto anteriore, gamboncello.

12) **Blade (Copertina di sotto)**, occupies the internal surface of the shoulder blade.

13) **Boneless blade (Fesone di spalla)**, with a triangular shape. The main part has a good market value especially in young animals.

Other Italian names: polpa di spalla, cotennotto.
14) Blade top (Copertina), rests on the shoulder blade between the boneless blade and the chuck tenderloin
Other Italian names: sorra, cappello del prete, polpa di spalla.

15) Chuck Tenderloin (Girello di spalla), a part with the shape of cone trunk, similar to the thigh.
Other Italian names: Rotondino di spalla, fusello, rollino, polpa di spalla.

16) Boneless chuck (Polpa di spalla), a cut that needs slow cooking and the presence of liquids.
Other Italian names: pulcio, nocetta di spalla, muscolo di spalla.

17) Neck (Collo), a cut that has small muscles and abundant connective lamina, so not very tender.
Other Italian names: giogo, giudo.

18) Ribs (Costate), a meat cut that is found between the neck and the short loin.
Other Italian names: braciole, polso, costola.

19) Flank (Pancia), a cut that includes the abdomen itself and, partly, the rib region.
Other Italian names: falda, spezzato, spuntatura di lombo.

20) Chuck (Sottospalla), it has a rectangular form and not very marketed.
Other Italian names: fracosta, polso.

21) Brisket and Clod (Petto e Reale), suspended and joint to brisket, flank and chuck.
Other Italian names: bianco costato, taglio reale, restringitore.

8.2 Meat Quality

The quality of meat refers to “all that determines the nature of something, in other words, the set of intrinsic and extrinsic characteristics”. Quality may also be the measure with which the product satisfies consumers’ needs. The quality of a product is determined by its various characteristics, which in the case of a food product, are classified into four categories:

- health and hygiene
- organoleptic
- technological
- nutritional

8.2.1 Sanitary quality

The health and hygiene quality indicates the aptitude of a food product when consumed ensuring the protection of consumers’ health. The health and hygiene hazards can be presented by chemical (phyto-sanitary residues, veterinary medicines residues, noxious additives, toxic metals) and/or biological contamination correlated to the presence or the absence of microorganisms, altering or pathogenic and external environmental factors that favour contamination and microbial alteration of foods.
8.2.2 Organoleptic quality

The organoleptic characteristics of meat are defined by a set of sensorial components (visual, gustative and olfactory) of a product through the evaluation of colour, odour, taste, tenderness and juiciness.

The **colour** conditions the external appearance of fresh meat, since it is linked to freshness and tenderness of the meat. It is mainly determined by the presence and the chemical state of two chromoproteins: the myoglobin and the haemoglobin (the latter is present in small amounts in the slaughtered animal). The myoglobin can combine with oxygen transported in the tissues to form oxymyoglobin, giving meat its brilliant red colour. The myoglobin can also become oxidized forming metamyoglobin, which gives a dark and very little brilliant colour to meat. The conversion of myoglobin into one of the two components depends on the partial pressure of oxygen; moreover, metomyoglobin is more stable than oxymyoglobin. Another parameter that produces colour change is the final pH.

**Smell** and **taste** are closely correlated and, together, give aroma to the food product. Both parameters depend on the animal’s feeding, the environment and the quantity of adipose tissue present in the meat. **Tenderness**, that is chewing consistency, depends on the ease with which teeth penetrate the thickness of the beef cut. This sensation is linked to the capacity of the meat to retain water, collagen content, the size of muscular fibres, the degree of permeation and the distribution of intramuscular fat (degree of marbling). Usually, meat from young animals is believed to be more tender than that from older ones due to the lower content and lower degree of collagen insolvability.

The **juiciness** of meat is the sensation given by juice release when chewed, and it is important when defining the agreeableness of meat. It is a characteristic that depends on the capacity to retain water in the meat after slaughtering, the final pH and the permeation of fat, which stimulates salivation and makes meat more succulent. A low capacity of water retention indicates a greater quantity of water released during chewing, therefore, more juiciness and, as a result, more tenderness.
8.2.3 Technological quality

The technological quality is the suitability of a product to be processed and preserved and is effected by parameters such as the pH and the potential water retention. The best pH for muscle preservation and processing in meat of valuable quality is between 5.4-5.8 included. Water holding capacity is correlated to pH (it decreases when pH decreases), the processing yield, the sensorial attributes and the microbiological stability of the product.

8.2.4 Chemical-nutritional quality

The nutritional quality is represented by the chemical composition of the food, therefore, by the presence and the content of protein, fats, minerals, vitamins and their bio-availability.

The proteins of the meat have remarkable biological value and high digestibility. Meat is an important source of minerals such as iron, zinc, potassium, magnesium, calcium, sodium and chlorine, which are present in the organic form of the product, that is, highly available and tolerable by the organism. In particular, the most representative forms are: vitamin B1 (thiamine), vitamin B2 (riboflavine), vitamin B6 (pyridoxine), vitamin B12 (cobalamine), vitamin PP (niacin), la vitamin H (biotin), pantothenic acid and folic acid.

Lipids are important natural substances in the diet and have a double function: as structural material, forming part of the cellular wall (cholesterol, phospholipids, glycolipids) and energy reserve material. The nutritional value of the food is increased by the presence of various vitamins, energy reserve. Lipid derivatives (cholesterol and phospholipids) regulate the functions linked to membranes, such as enzyme activity, receptors and ionic channels.

Lipids in meat are important both from a nutritional profile, effecting man’s health, and from the consumer’s profile, since consumers want more and more lean products. Fats are the easiest part to remove from products especially during processing and preservation, when going through oxidative processes, producing products with changed organoleptic characteristics (staleness) as well as molecules that give taste and aroma characteristics to some products.

Cholesterol is an essential component of animal cells and it is present in all foods coming from animals; it is a sterolic lipid molecule present in all tissues and in large quantities in the brain, bile and blood. It has hydrophobic characteristics and it is present both in a free form and esterified with long chain fatty acids and it has various functions in our organism, in fact:

• it intervenes with the formation and the reparation of the cellular membrane;
• it is the precursor of vitamin D, steroid hormones and sexual hormones;
• it is contained within the haemoglobin;
• it is the precursor of bile salts.
An important aspect of cholesterol is its presence in lipoproteins which takes it from one tissue to another through blood plasma. The lipoproteins with low density (LDL) transmit between 60-80% of the seric cholesterol, freeing it on the walls of the vessels; the lipoproteins with high density (HDL) remove cholesterol from arteries taking it back to the liver, and they differentiate due to the diverse composition of lipids, proteins and cholesterol.

**Fatty acids** are carboxylic acids with a hydrocarbon chain made up of 14 to 20 carbon atoms, which differ according to the degree of unsaturation, by number of carbon atoms and the diverse configuration.

The fatty acids can be divided into:
- Saturate fatty acids (SFA) (e.g. myristic acid, palmitic acid, stearic acid);
- Insaturate fatty acids, which can be mono- or poli-insaturates: the former (MUFA) is that with a double bond in the hydrocarbon chain (e.g. oleic acid); the latter (PUFA) has more double chains along the carbonylic chain and the essential linoleic acid and the linolenic acid.

Among the many activities of the essential fatty acids, the most important one is the role of preventing arteriosclerosis and arterial thrombosis: this is achieved by the lowering of the cholesterol level in blood, reducing in so doing, the formation of deposits on the arterial walls.
As it has been said in the previous paragraphs about the quality of meat product, and considering the specific laws on the protection of animals and the relation between breeding and the territory, the following considerations can be made: first it is necessary to conduct animal breeding with income in a manner that is in keeping with their needs to protect their health and well-being; the second is that, at present, there is a greater need for “quality” foodstuffs and therefore new parameters are being used to evaluate and certify them.

The aim of the research carried out by the University of Teramo, Faculty of Agriculture, Department of Science and Food Technologies, was that of evaluating the chemical-nutritional characteristics of meat from meat samples from the Marchigiana breed, with the PGI brand.

During the first phase, the evaluation on the Marchigiana beef, carried out during the 2007-2008 period, analysed 120 samples of meat from the Marchigiana cattle breed (PGI brand) bred in the Abruzzo Region for which the following parameters were calculated:

- pH
• humidity;
• protein;
• ashes;
• total lipids;
• fatty acids of all lipids;
• cholesterol.

During a second phase, 60 samples of beef cattle were used, 40 from breedings of the Marchigiana breed (20 from the Abruzzo Region and 20 from the Marche Region) and 20 commercially cross-bred ones coming from France. Analytic evaluations were conducted on:
• total lipids;
• fatty acids of all lipids;
• CoQ10;
• carnosine and anserine.

The animals were slaughtered at the age of 18-22 months with a live weight of 680-730 Kg. The sampling was done after about 24 hours from the slaughtering and the samples were stored at a temperature of -20 °C until the moment of analysis (the pH was measured after 24 hours from slaughtering). The samples were taken from portions of the muscle longissimus dorsi between the 7th and 12th rib.

9.1 Analysis of the achieved results

The analytic data obtained is all within the limits indicated by the Provision on Production of the Consortium of the White Bullock of the Central Apennines (tab.1)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Provision prescriptions on Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol</td>
<td>&lt; 50 mg/100 gr</td>
</tr>
<tr>
<td>Protein</td>
<td>&gt; 20 %</td>
</tr>
<tr>
<td>Unsaturated/saturated Fatty Acids</td>
<td>&gt; 1%</td>
</tr>
<tr>
<td>Ashes</td>
<td>&lt; 2%</td>
</tr>
<tr>
<td>Total lipids</td>
<td>&lt; 3%</td>
</tr>
<tr>
<td>Drip loss %</td>
<td>&lt; 3%</td>
</tr>
<tr>
<td>Cooking loss %</td>
<td>&lt; 35%</td>
</tr>
<tr>
<td>pH</td>
<td>5,2-5,8</td>
</tr>
</tbody>
</table>

Table 1: Average qualitative and technological parameters of the beef from the White Bullock of the Central Apennines reported in the Provision on Production.

The technological and chemical parameters of the analysed meat (water, protein, lipid, ashes and cholesterol content) and reported in table 2 and 3 is within the limits expected by the Provision on Production.
Table 2: Chemical composition of cattle meat with PGI brand produced in Abruzzo

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Average value</th>
<th>Provision Prescriptions on Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water %</td>
<td>75,4±1,65</td>
<td></td>
</tr>
<tr>
<td>Protein %</td>
<td>21,51±1,34</td>
<td>&gt; 20</td>
</tr>
<tr>
<td>Lipids %</td>
<td>1,89 ±1,00</td>
<td>&lt; 3</td>
</tr>
<tr>
<td>Ashes %</td>
<td>1,03 ±0,12</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>44,9±3,6</td>
<td>&lt; 50</td>
</tr>
</tbody>
</table>

Table 3: Percentage of technological parameters of the beef cattle with the PGI brand produced in Abruzzo

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values%</th>
<th>Provision Prescriptions on Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drip loss</td>
<td>2,92 ±1,29</td>
<td>&lt; 3%</td>
</tr>
<tr>
<td>Cooking loss</td>
<td>34,8 ±3,00</td>
<td>&lt; 35%</td>
</tr>
<tr>
<td>pH</td>
<td>5,55 ±0,09</td>
<td>5,2-5,8</td>
</tr>
</tbody>
</table>

Table 4: Percentage of saturate, monosaturate and polisaturate fatty acids of intramuscular lipids in the cattle meat with PGI brand produced in Abruzzo

<table>
<thead>
<tr>
<th>Saturated acids</th>
<th>%</th>
<th>Mono-unsaturated acids</th>
<th>%</th>
<th>Poli-saturate acids</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myristic Ac.</td>
<td>2.64±0,73</td>
<td>Ac. Palmitoleic</td>
<td>2.3±0,64</td>
<td>Linoleic Ac.</td>
<td>10,60±4,46</td>
</tr>
<tr>
<td>C14:0</td>
<td></td>
<td>C16:1</td>
<td></td>
<td>C18:2</td>
<td></td>
</tr>
<tr>
<td>Pentatetanoic Ac. C15:0</td>
<td>0,38±0,10</td>
<td>Transvaccenic Ac. C18:1 T</td>
<td>1,7±0,99</td>
<td>Linolenic Ac. C18:3</td>
<td>0,62±0,39</td>
</tr>
<tr>
<td>Palmitic Ac.</td>
<td>27,0±2,81</td>
<td>Ac. Oleic</td>
<td>30,4±4,08</td>
<td>Joint Linolenic Ac. cis-9-trans-11 CLA</td>
<td>0,21±0,10</td>
</tr>
<tr>
<td>C16:0</td>
<td></td>
<td>C18:1 W9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heptadecanoic Ac. C17:0</td>
<td>0,9±0,23</td>
<td>Cis -7 Octadecanoico Ac. C18:1W7</td>
<td>1,4±0,28</td>
<td>Eicosatetraenic Ac. C20:3</td>
<td>0,56±0,30</td>
</tr>
<tr>
<td>Stearic Ac. C18:0</td>
<td>17,0±2,45</td>
<td>Ac. Gondoic</td>
<td>0,14±0,09</td>
<td>Arachidonic Ac. C20:4</td>
<td>2,72±1,30</td>
</tr>
<tr>
<td>Ac. Arachic C20:0</td>
<td>0,11±0,04</td>
<td></td>
<td></td>
<td>EPA Ac. C20:5</td>
<td>0,21±0,17</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Docosapentenoic Ac. C22:5</td>
<td>0,45±0,36</td>
</tr>
</tbody>
</table>

Table 4: Percentage of saturate, monosaturate and polisaturate fatty acids of intramuscular lipids in the cattle meat with PGI brand produced in Abruzzo

As it can be observed in table 4, the stearic (C18:0) and the palmitic acid (C16:0) are the acids present in most of our samples. The former has no effect on health; while the latter causes an increase in the concentration of total cholesterol and the concentration of low density lipoprotein (LDL) in...
blood. The unsaturated fatty acid content, especially oleic (C18:1W9), linoleic (C18:2) and linolenic (C18:3) is influenced by various factors, the most important being the qualitative-quantitative composition of the diet given to animals.

As regards the content of metals, it can be seen as in table 5 that the registered data is within the expected average contents of cattle meat.

In particular, calcium and zinc seem to be the metals present with the highest quantities, while brass is present in low percentages.

<table>
<thead>
<tr>
<th></th>
<th>pm std</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron (mg/Kg)</td>
<td>16,30±3,22</td>
</tr>
<tr>
<td>Calcium (mg/Kg)</td>
<td>41,99±17,28</td>
</tr>
<tr>
<td>Zinc (mg/Kg)</td>
<td>41,04±8,45</td>
</tr>
<tr>
<td>Brass (mg/Kg)</td>
<td>0,42±0,33</td>
</tr>
</tbody>
</table>

Table. 5: Metal content (mg/Kg) in samples of cattle meat with the PGI brand produced in Abruzzo

9.2 Comparison between samples of meat with a PGI brand of the Abruzzo Region, the Marche Region and of commercial origin

From the analysis of the data regarding the intramuscular lipid percentage, about the samples from the Marchigiana breed with the PGI brand (coming from the Abruzzo and the Marche Region) and those from the commercial group (table 6), no significant differences have been observed between the two groups being examined.

<table>
<thead>
<tr>
<th></th>
<th>Abruzzo PGI</th>
<th>Marche PGI</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td>% lipids</td>
<td>2.26±0.94</td>
<td>2.28±0.78</td>
<td>2.47±1.05</td>
</tr>
</tbody>
</table>

Table 6: Intramuscular lipid percentage

However, as it is commonly known, the specifically important aspect of the lipid component is mostly linked with its qualitative profile. The overall lipids were therefore studied in further detail through the calculation of the composition of fatty acids. In table 7 below it is possible to notice the presence of significant differences related to the parameter at issue (particularly **SFA**: saturated fatty acids - **MUFA**: mono-unsaturated fatty acids - **PUFA**: poly-saturated fatty acids), among PGI bullock and the commercial ones.
Table 7: Percentage of fatty acids in intramuscular lips of cattle meat with the PGI brand produced in Abruzzo, in the Marche Region and in samples taken from the market

Despite the high total percentage of saturated fatty acids (SFA) registered in the commercial samples which is not statistically significant, it is possible to note that the same cannot be said for two of the saturate fatty acids that are among the most dangerous for health. In fact, it must be recalled how the negative effect of the SFA for human health is not the same for the single fatty acids. Among the most responsible for the increase of bad cholesterol (LDL) is for example, the Myristic Acid (C14:0) or the Palmitic (C16:0). Both fatty acids are significantly high in the samples of meat coming from the commercial group with respect to those of the PGI Marchigiana breed.

From the nutritional perspective, important for the potential capacity to reduce the level of cholesterol without lower the HDL, the mono-saturate (MUFA) was found to be significantly higher in PGI meat, related to single fatty acid for example C16:1w7 or C18:1w9, the more abundant percentage of mono-unsaturates.

The poli-unsaturated component (PUFA), which is particularly important for the prevention of cardiovascular diseases, has the essential fatty acids linoleic (C18:2w6) and linolenic (C18:3) of food origin, and fatty acids of cell membranes and mitochondria deriving from the desaturation and elongation actions on stock of the series (C:20-C:22); the former make up the permeation fat of meat and it is the most easily influenced component, while the latter make up the constitution phospholipids, which are less influenced by the diet or method of breeding. On the whole, no differences were registered for PUFA between the two groups but the values show, in PGI beef, a higher percentage of C18:3 (P<0.01) and lower percentage of arachidonic acid (C20:4) (a difference that is still statistically significant).

The illustrated picture confirms the diverse origin of fatty acids in beef: on the one hand acids produced by diets, depending on the breeding method and the type of submitted ration, while, on the
other hand, there are structural acids, which have more constant compositions that depend less on the productive system.

Therefore, when comparing the samples of the PGI brand coming from Abruzzo and those coming from the Marche Region it is observed that they do not differ both in the profile of fatty acids and the other parameters, while the differences between PGI Abruzzo and Commercial ones and the PGI March and the Commercial ones are significant.

9.2.3 Substances with important anti-oxidising activity

Coenzyme Q10

The Q10 co-enzyme, also known as ubichinone, of lipid nature, is an oxidative reducing agent which acts in the energetic production chain in mitochondrial cells. Moreover, it acts as an important liposoluble antioxidant in the skin, acting against peroxides that damage collagen and elastin, and therefore against the loss of elasticity and the formation of wrinkles. In an experimental manner it has been registered that Q10, in case of cancer, it has increase survival. Similar to vitamin E, the CoQ10 is a liposoluble and conducted studies have shown how to protect tissue that lack oxygen. It carries out a fundamental action in the production of energy and also antioxidising and protective actions against free radicals.

As a conclusion on the data regarding the analysis of bio-active molecules with antioxidant abilities present in the meat matrix and taken into consideration in this work, the results of the Coenzyme Q10 are reported below, expressed in ppm (table 8).

Observing the values obtained, no significant differences were registered for this parameter. Both for the samples of the PGI brand (coming from Abruzzo and Marche) and the commercial ones, the quantities of Q10 were around 15 ppm.

<table>
<thead>
<tr>
<th></th>
<th>Abruzzo PGI</th>
<th>Marche PGI</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Q10 (PPM)</strong></td>
<td>15±2.4</td>
<td>15.11±2.1105</td>
<td>16.63±4.23</td>
</tr>
</tbody>
</table>

Table 8: Coenzyme Q10 Analysis Results.

The obtained results confirm that even in this case the samples of the Marchigiana cattle breed with the PGI brand, even if from different regions, show very similar qualitative characteristics and present an almost “standardised” product.

Histidine Dipeptides: carnosine and anserine

The histidine dipeptides, that is, carnosine and anserine, are hydrosolubles that are found in various animal tissues (muscular and nervous), in blood and milk. Among their important functions are:

- neutralization of some radical peroxides, singlet oxygen and hydroxy radicals;
- stabilization of the membrane protecting it from oxidation;
• inhibition of lipid peroxidation;
• antiglycosylation action of protein;
• neuroprotective properties;
• anti-inflammatory properties;
• anti-tumoural properties.

Even as regards anserine and carnosine (table 9), interesting differences will be highlighted between samples from the PGI brand and commercial ones; indeed, the latter result being significantly poorer of such bioactive molecules.

<table>
<thead>
<tr>
<th></th>
<th>Abruzzo PGI</th>
<th>Marche PGI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANSERINE (mg/kg)</strong></td>
<td>325.62±127.97</td>
<td>192.92±60.2</td>
</tr>
<tr>
<td><strong>CARNOSINE (mg/kg)</strong></td>
<td>102.053±382.75</td>
<td>819.18±99.38</td>
</tr>
</tbody>
</table>

(a,b: P <0.05; A,B: P<0.01)

Table 9: Analysis results of the Anserine and Carnosine content

In fact, the contents of table 9 show how both the analysed histidine dipeptides are present with significant higher quantities in beef from animals bred according to the provision of the PGI disciplinary.

Comparing the data regarding anserine and carnosine in detail, it is noticed that there are no differences between the PGI brand of Abruzzo and that of the Marche Region (table 10).

<table>
<thead>
<tr>
<th></th>
<th>IGP Abruzzo</th>
<th>IGP Marche</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANSERINE (mg/kg)</strong></td>
<td>351.01±66.10</td>
<td>316.54±144.89</td>
</tr>
<tr>
<td><strong>CARNOSINE (mg/kg)</strong></td>
<td>1052.37±200.47</td>
<td>1133.98±496.45</td>
</tr>
</tbody>
</table>

(a,b: P <0.05; A,B: P<0.01)

Table 10: Analysis results of Anserine and Carnosine content

The Regulations on the geographic productions the European Community attempted to attune and adapt the agro-food policies of the various Member States for the protection and the re-launching of typical products. From this perspective, the Italian scenario sees the beef of the White Bullock of the Central Apennines which given its peculiar quality characteristic, linked to traditional elements, has assumed significant importance economically and commercially.

In order to obtain quality cattle beef, all the operators of the supply chain must commit themselves to good management, basing their work on control that ensures not only that the meat has the delivered characteristics, but above all that the production process has occurred according to the good practices suggested by the Disciplinary and the codes of the Regulations.
The data obtained from the study carried out by the University of Teramo shows that the values of the qualitative parameters of the beef with the PGI brand produced in Abruzzo and in the Marche, even if coming from various breedings, are perfectly within the limits set by the Provision on Production of PGI of the “White Bullock of the Central Apennines” showing that keeping to the provisions of a production disciplinary, leads to achievement of a standardised product and provides consumers with quality throughout the entire productive supply chain.

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10 - SERVICES FOR BREEDERS AND ASSOCIATIONS

Edited by:
Euromediterranea – Social Promotion Association

The objective to encourage integration and the cooperation among cross-border regions is pursued through the transferring of management experience in agricultural services and the construction of a service system common to all agro-zootechnical companies. In fact, the Marcbal project aims at transferring national know-how also as regards agricultural services, in the form of associations and innovative labelling and traceability systems.

10.1 Services for breeders

The Regional and Provincial Farmers Associations are connection elements between the institutional level (selective) and enterprises, guaranteeing the implementation of functional controls on animals, besides carrying out all those initiatives that can contribute to rapidly improve bred animals, with a more economic company management, the improving of economic results in the zootechnical enterprise and a more efficient valorization of the cattle and products derived from it. The selec-
tion itself, the assistance offered to breeders and all the activities linked to it – dispatched with the
disciplinary of the herd book – is a fundamental service given to farmers.

10.2 The associationist structure and the services offered

The national breeders associations are structured on three levels.

The **AIA – Italian Breeders Association** – established on 20th August 1944, in Rome, with the aim
of reviving Italian zootechny devastated by the World War II. The initial structure was rapidly
expanded and spread over the national territory supporting every sector of the Italian zootechnical
activity and developing a series of activities to assist companies, which contributed to make Italian
zootechny one of the most advanced worldwide. The actions of AIA – as a managerial nucleus of
services at a national level – focus on technical, managerial, economic, scientific and dissemination
activities.

The **Regional Breeders Association** is a second grade organisation made up of APA (Provincial
Breeders Associations). Its purpose is to:

- Coordinate the activities of the associated organizations;
- Represent and assist the members with respect to the Region, public and private organs, regional
  authorities and organizations, with which it collaborates; the mission purposes of representation
  and assistance are implicit to the associative relation and is binding;
- Carry out technical and economical function in the zootechnical sector to promote and implement
  all the initiative of regional competence, aiming at increasing and improving the production of
  animals and to valorize zootechny.

Moreover, ARA, can carry out specific functions and activities with reference to unions and associa-
tions of agricultural producers and their committees.

The **Provincial Breeders Association** is a third level organization and has the following purposes:

- promote and encourage direct studies and research to solve specific technical and economic pro-
  blems, forming apposite, temporary or permanent, committees;
- fulfil tasks and functions that, within the province and specifically in the productive sector, are
  assigned by the State (through AIA), the Region, the local entities or other public bodies;
- provide, therefore, for the implementation of work to improve zootechny through control on pro-
  ductive attitudes of animals and the keeping of the herd book as well as the determining the
  orientation of selective policies;
- promoting the implementation of equipment for the gathering of zootechnical products, for their
  processing and the placement of their derivatives, taking care of the activities on behalf of and in
  the name of members;
- assist associates and provide to the purchasing and the placement, locally or abroad, of animals,
  raw materials, derivates and anything necessary from breeding on behalf of the latter;
- provide (upon delegation) to any execution necessary to obtain contributions allotted for zoote-
 chnical initiatives;
• promoting initiatives which aim at improving the feeding of cattle

ARA or APA (depending on the regional organization, for example between Marche Region and Abruzzo Region there are variation in the organization of competences and organs) usually put the following services to the direct avail of breeders:
• Delivery of genealogical certificates
• Delivery of auricular labels
• Service for early cattle pregnancy diagnosis, post partum visits and identification of genital apparatus diseases via ultrasound
• Service for the cutting of horns
• Technical assistance service for the dairy and beef cattle sector: diagnostic, virological, and serological check ups, the identification of aflatoxin and the genotypization for cows other than dairy ones, feed and varied pathological material (animal internal, abortions, organs and blood)
• Filling-up of application form to access regional contributions to buy male and female reproducers of cattle or sheep species registered in the Herd Book
• Examinations for the estimation and the evaluation of animals registered in the Herd Book
• Collaboration in the marketing of live stock for selection
• Management of handbooks for hygiene packages

10.3 Exhibitions and Conventions

The associations – both ANABIC and APA or ARA – organize official exhibitions besides conventions and seminars to exhibit the animals registered in the Herd Book. The breeders carefully prepare the animals to be presented, which will be evaluated by judges. It is a very important opportunity to compare and verify technical results, followed by conventions, press conferences, meetings and auctions of reproducers.

10.4 ISO 9001:2000 Certification

Since 2003, the activity of the Genetic Centre, the Herd Book, the Genetic Evaluation and Morphological Evaluation has been documented and summarized in procedures and operative instructions so as to obtain the quality certification according to regulations ISO 9001:2000, which was obtained in October 2003.
10.5 The electronic certification of meat

Innovative systems, that represent a joint service, both for breeders and consumers, go hand in hand with activities that aggregate breeders. **Bovinmarche** is an example of this. It is a consortium of breeders from the Marche region since 1987 operate with the precise intention of identifying the quality beef of the Marche, and to teach a clear and precise method to consumers so as to make sure they recognize it. The associated breedings (over 600) are all small in size with an average of 15 stalled animals; small companies that produce high quality with traditional methods, respecting the well-being of animals and the environment in which they live.

With the view of guaranteeing quality, Bovinmarche was the first to develop, in Europe, an electronic meat certification system, capable of affirming, in a definitive manner and with extreme security, the origin and the characteristics of every single beef cut regulated by a specific provision. When breeders adhere to this type of programme it means creating a direct supply chain, producer – processing – market – consumer in which every step is characterised by the countermark of **tout court** quality, guaranteeing the marketing of the product as well as the possibility to implement their own activities.

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11 - CONCLUSIONS

Rusticity, precocity, harmony in shape, adaptability and ease to deliver are the characteristics that allow the Marchigiana cattle breed to use grazing and semi-grazing breeding systems with good productive and reproductive performance. Therefore, the breeding of the Marchigiana must be considered as a valid opportunity for the production of meat and for cross-breeding in territories defined as “marginal”. 

In fact, the breeding of the Marchigiana may be a strength that valorises these areas since it integrates with the territory, preserving and improving its landscape peculiarities with the possibility of becoming a source of entrepreneurial activity, to process and market high quality products. From this perspective, the project for the cooperation of cross-border Marcbal regions aims at creating a government system of the quality zootechny of the Marchigiana cattle breed in the Western Balkans, an alternative source of income for rural areas, promoting the grazing and the semi-grazing breeding systems which bring about the sustainable recovery and development of agriculture techniques and territory traditions, valorising productions through the strengthening of methodologies of health, food and quality safety.
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