Chapter 26

Cabannina Cattle Breeding: An Agro-Ecological Challenge for Sustainable Rural Development in Northern Italy

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Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/53155

1. Introduction

Intensive farming is an agricultural production system characterized by widely adopting external inputs - such as capital, mechanization, infrastructures, pesticides and chemical fertilizers intensively used - which affects the natural environment and rural societies. Since it allows to produce more food on a given land extension, such agricultural choice has been the predominant response to population growth so far. While permitting to raise many animals in limited areas, intensive animal farming practices require a large amount of food, water, medical treatments, capital intensive technology, energy, and fuel. Is being the selection of animals with rapid food conversion into milk and meat the aim of every industrial farm, a decline in, for example, the animal reproductive performances and in the product quality follows. Thus, nowadays problems in the dairy cattle scenario are easily highlighted. Just to name Friesian breed, its reproductive performances decreased worldwide with negative consequences on both cow robustness and longevity due to increased stress, udder health disturbances and locomotion disorders, which meant damages to the physiological parameters typical of healthy cows.

Despite all the above mentioned problems associated with conventional farming, many positive developments are creeping in. Several alternative initiatives are now flourishing all around the Italian peninsula to promote ecological agriculture; preservation of small farmers' livelihoods; production of healthy, safe and tradition-linked foods; localization of distribution, trade and marketing. These typologies of traditional agriculture offer promising models for marginal areas as they promote biodiversity, thrive without agrochemicals, and

sustain year-round yields. Technological approaches are welcome provided, they promote yield improvements based on agro-ecological principles, emphasizing diversity, synergy, recycling and integration of animals, soil, and water; moreover, social processes involving and empowering a community are welcome, too. In the Italian north-western region of Liguria, Petramartina farm can be considered as a challenging pioneer thanks to its following agro-ecological principles in order to recreate a traditional and sustainable dairy breeding based on autochthonous cows, called Cabannina.

2. Conventional dairy farming in the "River Po Plain" and its critical points

The River Po Plain is characterized by an industrial breeding system whose bovine herds at present are fewer, larger, more specialized and more capital intensive than they were 60 years ago.

Revealing data are briefly shown in the following table (Table 1).

NATIONAL DATA			
YEAR	CONSISTENCY		COWS/HERD
	HERDS	COWS	
2002	15.106	1.088.178	72
2003	14.984	1.107.701	74
2004	14.823	1.100.543	74
2005	14.317	1.101.657	77
2006	14.069	1.102.655	78
2007	13.818	1.100.401	80
2008	13.510	1.101.868	82
2009	13.327	1.103.453	83
2010	13.164	1.113.859	85
2011	12.922	128.626	87

Table 1. Italian National Data about number of herds, total cows, and average number of cows per herd.

As clearly shown, since the last 10 years the Italian dairy situation has followed the international trend for which farmers, have to increase the number of animals in their herds to sustain their businesses.

Thus, in recent years the dairy system has been mainly concerned with both improving animal performances and with increasing the number of heads per farm in order to reduce

http://dx.doi.org/10.5772/53155

fixed costs that represent, together with raw materials necessary to compose animal feed formulations, the most important passive voice of a farmer's budget.

The following table (Table 2), gives an overview of Italian Friesian cow milk production and their reproductive situation in the last years.

Year	Milk Production	First Calving/ Total Cows	Days open	Number of Lactation/Cow
	(q/cow/year)	(%)	Mean	Mean
2004	85,9	34,8	147	2,48
2005	89,1	35,6	136	2,47
2006	89,4	36,1	141	2,45
2007	90,3	35,5	143	2,46
2008	89,8	36,2	143	2,46
2009	88,7	35,6	141	2,46
2010	91,3	36,1	141	2,44
2011	91,9	36,4	144	2,39

Table 2. An overview of Italian Friesian cow official production by AIA (Italian Breeders Association)

As shown, the increased number of heads and of milk production amount were not followed by any improvement in reproductive efficiency. In fact, Table 2 clearly demonstrates how the reproductive physiology of the animals was damaged. And mainly in Friesian breeds, cows' robustness and longevity negatively affected by increasing stress, udder health disturbances and locomotion disorders [1], are an issue of major concern to farmers. From a physiological point of view, Holstein cows reached a very critical situation having missed their good reproductive efficiency characters (e.g. calving interval and conception rate [2], excellent longevity in farm (only 2,39 lactations in their life), resistance to stress and diseases (metabolic syndromes, ketosis, mastitis and foot diseases) [1,3,4], whereas they dramatically increased "energy and financial voracity" (diet based on starch and protein meals, great health and structural investments due to several highly-recurring diseases [4-6]. A recent study conducted on an Italian dairy farm, located in the River Po Plain, highlighted the extreme financial voracity affecting a conventional farm of good quality in order to run it and make it survive [7]. The Authors showed that even an excellent business consisting of 208 productive cows, 70% of which are healthy animals, can lose more than 36000 €/year on including both direct and indirect costs due to animal diseases such as veterinary therapies, decrease in productive performances, milk removed, price-cutting for high milk quality, etc. These data are worrying in the consideration that in Italy milk production represents one of the most important sectors of its agro-industry,. In fact, in Europe Italy is the most important cheese producer and exporter, with its about 460,000 tons of products and almost 3 billion Euros (data from www.clal.it, www.ismea.it) derived from PDO (Protected Designation

Origin) and PGI (Protected Geographical Indication) production. Its most representative cheese is certainly *Parmigiano Reggiano* and *Grana Padano* that recently increased by 9.8% its export trend to Germany, the United States, France, Switzerland and the United Kingdom.

Italian breeders have to care about all the important milk quality parameters involved in cheese making processes such as milk fat, proteins and somatic cell count.Recently, Italian researchers demonstrated that milk whose somatic cell content is greater than 400,000 cells/ml evidences a scarce aptitude to rennet coagulation and cannot be generally considered suitable for cheese production, with particular reference to Grana cheese production [8].

Having in mind the difficulties characterizing the present background and in the aim to confirm Italian national data, some analytical studies were performed in five different Friesian herds bred in the River Po Plain.

The following parameters were investigated: milk production (herds A and B), reproduction and sanitary situation (herds C, D, E).

In herds A and B from an area south of Milan (Lodi) fat and protein in the milk yield as well as total cheese yield were monitored. Tables 3 and 4 show key results from this investigation.

YEAR	LACTATIONS CLOSED	MILK YIELD	FAT		PROTEIN		CHEESE YIELD
		Kg	%	Kg	%	Kg	Kg
2007	239	10.608	3,74	397	3,57	379	825
2008	243	10.639	3,68	392	3,48	370	811
2009	254	10.184	3,78	385	3,56	363	793
2010	232	9.991	3,87	387	3,56	356	785
2011	228	10.193	3,52	359	3,48	348	765

Table 3. Milk Production Data in Herd A

YEAR	LACTATIONS CLOSED	MILK YIELD	FAT		PROTEIN		CHEESE YIELD
		Kg	%	Kg	%	Kg	Kg
2007	54	10.691	3,37	360	3,3	353	768
2008	55	9.385	3,53	331	3,39	318	695
2009	48	9.344	3,68	344	3,29	307	690
2010	52	9.380	3,67	344	3,27	307	690
2011	55	8.536	3,45	294	3,28	280	616

Table 4. Milk Production Data in Herd B

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Clearly, milk production and milk aptitude to produce cheese underwent a dramatic decrease causing economic losses to breeders.

In herds C, D, and E from an area west of Milan (Abbiategrasso), days open (DO), number of insemination for conception (AI), culling cows (CC) together with sanitary problems and treatments were monitored and key results from this investigation are represented in table 5.

HERD	COWS	DO	AI	CC
C	688	154	2,53	30%
D	438	147,5	2,09	36,50%
E	345	130,7	3,18	29,03%
TOTAL	1471			
AVERAGE		144,1	2,53	32%

C,D,E = herds in Abbiategrasso (MI); DO = days open; AI =number of artificial insemination per conception; CC= number of culling cows.

Table 5. Average data in Herds C, D, and E.

Such data broadly confirm official data related to Italian national situation. Among critical points to be underlined both nationally and internationally, we should consider that not only animal intensive breeding dramatically increase worldwide, but vegetal monoculture as well. Thus, while intensive farming and agriculture can be considered extremely competitive and the only way to feed a fast-growing human population, they also cause different economic, environmental and social problems [9]. In fact, from an ecological point of view, consequences of industrialization are manifold [10] as detailed below:

a. Cycles of nutrients, energy, water and wastes become more open rather than closed as occurring in a natural ecosystem;

b. The natural habitat of most wild creatures can be limited or destroyed by industrial agro-farm, and most soil can suffer erosion;

c. A large amount of energy input is needed to produce, transport, and apply chemical fertilizers;

d. Dwindling and ever more expensive fossil fuels are used to derive agrochemicals, and to work fuel-based mechanization and irrigation operations, the core of industrialized agriculture;

e. Air pollution can be prompted by chemical fertilizers that were recently implicated in the destruction of the ozone layer and in global warming;

f. Animal and vegetal biodiversity are severely affected as species more susceptible to diseases are selected.

Moreover, an excessive use of fertilizers is linked to acidification/salinization of soils and to a higher incidence of insect pests and diseases through mediation of negative nutritional changes in crop plants [11]. It also implies several harmful effects on the health of workers spreading them, of people living nearby or downstream/downwind an area of application, and of consumers swallowing leftover pesticides from food.

Last, but not least, a genetic selection is required in both vegetal and animal conventional production to maximize production, which implies biodiversity decrease. Thus, the amount of crop diversity per unit of arable land decreased and croplands tended towards concentration. In fact, in order to serve as many markets as possible some political and economic forces influence a general trend to devote larger and larger areas to monoculture [10].

3. Agro-ecological principles as a potential solution to extremely intensive breeding

Nonetheless, excessive intensive breeding can be successfully contrasted and new ecological concepts and principles can be applied to design, development and management of sustainable agricultural systems. In fact, agro-ecology can be a sensible solution.

Agro-ecology is the science that studies the relationship between agricultural production, land and traditions regarding a given territory [11]. It is a theoretical and practical discipline derives from different experiences related to organic agricultural production, characterizing the last and present centuries.

It investigates the elements of an agricultural ecosystem and their interactions carefully and provides principles and methods of work. Principles and methods that do not merely consider production but also the ecological, technical, socio-economic and cultural spheres of the agro-ecosystem.

Major aims of this science are:

i. to increase both functionality and productivity of a business and an ecosystem;

ii. to deal with biodiversity conservation and nutrient recycling;

iii. to optimize local resources usage and economic viability of a farm.

Following these objectives, some practices - such as crop rotation and use of local varieties - essential to the microbiological and mineral balance of the soil can be recovered together with techniques well-known since past times but never applied on a large scale, e.g. the on-farm production of natural preparations and fertilizers [11]. Even planting local varieties of fruit trees and hedges, a good practice swept away by the advent of industrial agriculture, can help to increase biodiversity within a farm and promote a more balanced agro-ecosystem. A subsoil rich in organic and mineral elements and a greatly diversified topsoil make vegetation more durable and more resistant against diseases and insects.

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Present industrialized agriculture, as Altieri underlines, is no longer sustainable. In fact, conceiving a constant supply of water, some cheap power and climate exploitation with no abrupt changes is absolutely utopian nowadays.

For instance, the old system based on mechanization, e.g. forage drying, cannot work any longer because of the continuous rise in price of fossil fuels. Not to say about the global use of herbicides that counts about 2.6 million tons per year and costs 25 billion euros. Being excessive and uncontrolled, they negatively affects wildlife and pollinators, the quality of water and fishing activity, and pose a serious risk of poisoning humans and animals. In addition, arthropods and weeds show high adaptation to these substances, while abuse of monocultures indirectly select pests and makes them more resistant [10]. Table 6 illustrates the fundamentals of agro-ecology.

Enhancing biomass recycling, with a view to optimizing organic matter decomposition and nutrient cycling over time.
Strengthening the " immune system" of agricultural systems by enhancing functional biodiversity, natural enemies, antagonists, etc.
Providing the most favorable soil conditions for plant growth, particularly by managing organic matter and by improving soil biological activity.
Minimizing losses of energy, water, nutrients and genetic resources by enhancing conservation and regeneration of soil and water resources and agro-biodiversity.
Diversifying species and genetic resources.
Improving beneficial biological interaction and synergies among the components of agro-biodiversity, thereby promoting key ecological processes and services.

Table 6. Principles of Agro-ecology by Altieri (2012) [11].

As seen in Table 7, in a recent study Koohafkan et al. [12] formulated some questions indicating what can be defined as an agro-ecological farm.

1. Do they reduce poverty?
2. Are they based on rights and social equity?
3. Do they reduce social exclusion, particularly for women, minorities and indigenous people?
4. Do they protect access and rights to land, water and other natural resources?
5. Do they favor redistribution of productive resources?
6. Do they substantially increase food production and contribute to household food security and improved nutrition?
7. Do they enhance families water access and availability?
8. Do they regenerate and conserve soil and increase soil fertility?
9. Do they reduce soil loss / degradation and enhance soil regeneration and conservation?
10. Do practices maintain or enhance organic matter and the biological life and biodiversity of the soil?

11. Do they prevent pest and disease outbreaks?
12. Do they conserve and encourage agro-biodiversity?
13. Do they reduce greenhouse gas emissions?
14. Do they increase income opportunities and employment?
15. Do they reduce variation in agricultural production under climatic stress conditions?
16. Do they enhance farm diversification and resilience?
17. Do they reduce investment costs and farmer dependence on external inputs?
18. Do they increase the degree and effectiveness of farmer organizations?
19. Do they increase human capital formation?
20. Do they contribute to local / regional food sovereignty?

Table 7. Questions to define an agro-ecological farm. (Koohafkan, 2011) [12]

4. Cabannina breeding in Aveto Valley

4.1. Territory

Aveto Valley represents the natural settlement area of Cabannina cows. When a war correspondent, Ernest Hemingway wrote in his diary in 1945: "I have just passed across the most beautiful valley in the world". In fact, it is one among the narrowest valleys of the northern side of the eastern Ligurian Apennine, where both the climate and the lands have unique characteristics thanks to the favorable altitude, which ranges from about 350 to 1800 meters, and the proximity to the sea. Rain is much more abundant than in the rest of the region, with about 2500 mm per year as peak value, especially in autumn and spring. In winter, snowfalls are stable, usually abundant, and temperatures can drop below 10 °C. In summer, the valley climate is humid and can become cooler at high altitude.

Figure 1. Aveto valley panorama, from Scabbiamara area.

http://dx.doi.org/10.5772/53155

The river Aveto flows through the valley floor; it springs in Prato Lungo, an area just below the village of Acquapendente near Mount Caucaso. Slowly winding, it creates different landscapes where pastures alternate to woods, meadows and rocky canyons. Then it passes through the province of Genoa, to reach the province of Piacenza. In Confiente place (a term that means "confluence") it gets into the river Trebbia, a tributary of the Po river.

In this context, the Cabannina, a great grazer even in extreme conditions, perfectly adapted to the territory and evolved. In fact, it can climb to the ridges and resist cold temperatures as well as snow without any problem like other northern breeds, such as the Highlands of Scotland. Thanks to these features this breed could spread to other areas of Liguria where the animals can graze free on green pastures surrounded by woods all summer long and where many businesses breed only one race.

4.2. A short historical account

Modern cattle breeds derive from two domestication events of the ancestral "Bos Primigenius" occurred in South West Asia and in Asia, which gave rise to the "Bos Taurus" and "Bos Indicus" respectively [13-15]. Hence, it is believed that these animals may result from a particular population of Uri that lived in the Southern Alps area [16]. Their dairy characteristics and adaptation to the territory still show their ties with the Bos Primigenius.

In the past the breeder families of Aveto Valley gathered in consortia; alternately, every producer received milk by the other members and made cheese. Every family was given a wooden stick where some notches were carved to mean milk given to community, a form of barter locally named ‘cangiu’, i.e. ‘exchange’. The animals were let loose in the pastures; for most of the year they were fed only with fresh forage and homemade feed supplements such as boiled potato skins, cooking water and bran [17]. When necessary, transhumance to Tigullio coast occurred. At the beginning of the twentieth century there were about 40,000 specimens that in the postwar period underwent a dramatic reduction in their number as countryside was abandoned, people migrated towards cities and intensive farms arose.

In February 1963, Cabannina cows risked their extinction on account of Law No. 126, "Regulation of Bovine Reproduction", - now repealed- requiring their forced slaughter and replacement with apparently more productive breeds. When this law became effective the Aveto breeders, strongly determined to preserve Cabannina, started their resistance against the Provincial Inspectorate of Agriculture. Attempts were made to combine different races, such as Bruno-Alpine, to the native heads, but with little results. In this regard, Maimone studied these two races years later in 1981 [18]. Combining the data collected by Orefice in 1978 [19], it was certified that Cabannina reproductive efficiency was better than Brown one and its economic life was greater thanks to the early age of its first birth and the reduced inter-calving period (84 days versus 140). Brown also appeared to have an inferior capacity to pasture, especially in villages where Cabannina was farmed, and could not stand the scarce food resources in the area showing phenomena of piroplasmosis which Cabannina breed could better fight against. In fact, originally Aveto Valley was a large swamp and over time native breed may have developed a natural resistance to the protozoa responsible for the disease.

Since 1974, the studies by Usai (1974), Orefice (1978) and Maimone (1981) [18-20] contributed to the promotion of Cabannina breed. In 1978 Orefice proved that in the town of Rezzoaglio there were about 500-550 heads of this typical breed. In 1981 when a census was made, out of 759 heads left only 158 were phenotipically Cabannina. Thus, an exemption to law No. 126 was decided in order to use Cabannina reproductors, and in 1985 the "Anagraphic Register of indigenous cattle populations and ethnic groups of limited diffusion " was established.

Despite various interventions Cabannina heads have steadily declined. From a survey conducted in 2010 by the Provincial Association of Breeders, only 254 heads are left on the Ligurian territory, mostly concentrated in Aveto valley. In the same year Cabannina breed has got one of the 193 Slow Food Presidia on the Italian territory. The network of Slow Food Presidia was established in 1998; it protects and preserves traditional products made according to old techniques, often present in remote areas of our country, and makes them distinguishable by a logo.

Figure 2. U'Cabanin trademark of Cabannina raw milk production.

In our case it is not the product to be preserved, but the breed as a part of it, similarly to other endangered species such as the Black Pig Nebrodi of Sicily and the Black Cock of Val di Vara in Liguria (www.slowfood.it). In 2007 a cheese made only from Cabannina raw milk began to be produced under the trademark "U Cabanin". Compared to the 1981 census the number of Cabannina heads has slightly increased, but the situation remains critical, being this breed still at high risk of extinction.

4.3. Cabannina cow

Breed standards required to register animals were defined in a specific Registry for Breeds under Limited Distribution. A recent dissertation from the Faculty of Veterinary Medicine in Parma [21], collected biometric data on Cabannina cows; such data prove how their average measurements have changed according to observations performed from mid'70s. In fact,

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compared against race specifications, height at withers, set from 1.18 to 1.20 m for females, and from 1.25 to 1.30 m for males, appears to be about 10 cm higher, as well as other parameters related to both sexes. Circumference of front shank, as well as head and rump bis-articular width remained unchanged.

Figure 3. Pasturing Cabannina cows in Scabbiamara area.

Natural breed evolution and feed were considered to be factors influencing the named changes, but the investigation even considered the influence from crossings with Brown Alpine cows after Law 126 came into force when they began to replace the crossings. Moreover, while in the past the cows were fed exclusively on forage and leftover food, such as potato peels, the recent introduction of feed concentrates, even not properly balanced ones, may have boosted the growth of Cabannina breed. Actually, its small size should be considered as a positive feature to keep because it makes these cows excellent grazers even under extreme conditions, and low feed consumers, which means a substantial economic advantage for breeders [21].

4.3.1. Rusticity

Cabannina breed shows a very low incidence of diseases, virtually no hoof problems, or mastitis. No dystocical parturitions and on average calving-conception occurs after 80 days [21].

4.3.2. Physiological reproductive features

Under normal conditions and in the absence of any drug treatment, the involution of the uterus, is completed within 4-6 weeks post-partum. A recent work about uterine involution [22], shows that the reproductive physiology of Cabannina is characterized by a rapid recovery of ovarian activity. In fact, the onset of first estrus can be observed 20 days after birth and the fertilizing opportunity occurs in the following cycle, at about day 40. Features that allow farmers to achieve the advantage of a calf per year, i.e. maximum productivity, maximum reproductive efficiency and excellent mammary functionality.

4.3.3. Physiological productive features

Milk from Cabannina cows was carefully examined at the laboratory of Veterinary Physiology - University of Milan – [22-23] as to the dimensional characteristics of its fat globules, which make it a product of great value. In fact, it was proven the presence of small fat globules resulting in a wide specific surface area (SSA); thus, intestinal lipases can easily attack them and milk results to be highly digestible [24]. Moreover, as fat globules interact with casein curd, their size also influence the processes of lipolysis, bacterial colonization and cheese ripening [25]. High levels of unsaturated fatty acids and desaturase indices were highlighted, with important antimicrobial and biological effects and influences on human health as described in recent literature [26-30].

During cheese making processes, titrable acidity is one among basic parameters to control as it indicates good quality and good preservation of the product. Its normal values range between 3.20 and 3.80 °SH/50 ml. in fresh milk [21]. In 1987, Zanetti et al. [31]found that a low titrable acidity represents a condition technologically limiting optimal cheese making. In fact, hypoacidic milk, takes longer to turn into cheese when rennet coagulation is used, thus affecting dairy processing negatively. Finally, even though both remained within normal range values, milk from Cabannina showed average values of SH ° definitely higher than milk from Friesian breed, which can positively influence yield in cheese making processes [32].

5. Petramartina farm

5.1. Farm structure and management

Petramartina farm is located at Scabbiamara in Aveto Valley at an altitude of 1000 m above sea level. (GPS coordinates: 44 ° 31'60 "N - 09 ° 22'60" E). It was established in 2009; since then, the owners and two workers have looked after the animals and manufactured dairy products. The farm represents a modern rural reality carefully merged with traditions. In fact, its products are sold directly to consumers or to small local retailers (EEC Reg. 852/04) according to the principles of short food chain. The business is articulated into several buildings: an animal shed, a service area, a dairy product manufacturing room, a seasoning room. An area devoted to direct sale and a classroom to provide educational services for students and adult parties have already been designed and will be realized to complete the farm.

5.2. Cattleshed, animals and their reproduction

The old cattleshed is under the house of the herdsman/milker as it used to be in the past when they derived heat from nearby animals. It is characterized by stalls for the cows, used only to milk them and shelter them in winter, when they rest on chipboard.

As shown in Figure 5, the cattleshed is built according to an old concept: with no separating bars or “educators”, as they are not essential where human-animal relation is still strong. Manure removal is not mechanized; the pit where it is kept to be spread over crops the farm

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can use is just close to the stable. In spring, the animals can graze freely. They are usually let loose day and night and lead to the cattleshed only for milking. During the night cows in lactation are kept in the pastures closer to the shed, whereas animals in dry and heifers can graze in the fields farther away.

Figure 4. Petramartina Farm Logo.

Figure 5. The cattleshed.

Milking is performed at 6.00 am and 6.00 pm by a cart machine; it starts with tail binding and then pre-dipping follows, i.e. a neutral liquid detergent (foam on) characterized by a sanitizing and softening action is applied. Such a procedure makes it easier to milk cows. To finish, post-dipping is carried out using a highly viscose solution of benzyl alcohol to pro-

tect nipples; in fact, it forms a barrier against bacteria, thus reducing mastitis and related problems for Cabannina cows at lowest level possible.

NUMBER	COW NAME	AURICULAR BRAND	STATUS
1	BIONDA	IT010990001714	Production
2	MARTINA	IT010990009965	Production
3	NORA	IT010990009966	Production
4	NEBBIA	IT018990022884	Production
5	BELLA	IT010990013162	Production
6	PETRA	IT010990013163	Production
7	ESMERALDA	IT010990012274	Production
8	PICOLA	IT018990042730	Production
9	LILLY	IT018990032152	Production
1	RAYA	IT010990013806	NORA
2	LENA	IT010990013807	NEBBIA
3	SUSY	IT010990015551	ESMERALDA
4	MIRA	IT010990013805	PICOLA

Table 8. Animals in the stable in August 2011

As shown in Table 8, productive animals are currently limited to 9 but their number is constantly increasing when compared with previous years. Figure 6 proves that trend related to number of Cabannine cows assigned to milk production is becoming larger and is equal to 2.5 subjects/year, which can prompt towards implementing their relative abundance in the area, sustaining their reintegration within typical Ligurian breeding and, last but not least, ensuring biodiversity in cattle. Year 2011 was a greatly positive as 4 female cows directed to production were born.

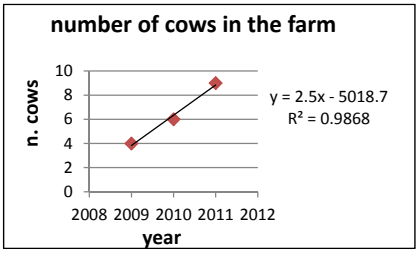

Figure 6. Cabannina cows increase from 2009 to 2011. Trend for forthcoming years.

http://dx.doi.org/10.5772/53155

Management of reproduction represents one among breeders' tasks: to increase genetic variability artificial insemination is performed using Cabannino bull paillettes preserved by APA (Association of Provincial Breeders) since 20 years ago, which is essential to recover a cattle breed. Bulls are chosen carefully to keep blood lines as much as possible divided. This is important primarily because deleterious inbreeding must be avoided and, secondly, because genetic and phenotypic data about bull semen have not been collected so far.

NAME	INSEMINATION DATA	BULL	DELIVERY DEADLINE	DELIVERY
PICOLA	20-05-2010	PIPPO CAB	26-02-2011	06-03-2011
NORA	19-07-2010	PIP	19-04-2011	06-05-2011
NEBBIA	01-09-2010	BIMBOTTO	01-06-2011	08-06-2011
ESMERALDA	26-09-2010	LEO	26-06-2011	06-07-2011
BIONDA	05-11-2010	MANDRIN 35992	05-08-2011	23-08-2011
MARTINA	29-12-2010	FARFALLO	29-09-2011	-
LILLY	07-05-2011	LEO	-	-

Table 9. Insemination data and birth calendar.

Table 9 details dates about each insemination performed and deliveries occurred. As to inseminations, only one is necessary per animal, which can decrease reproduction management costs. As to calving-conception interval, data from the farm under investigation showed compatible with the breed trend, reaching about 80 days, against current 145 days related to Italian Friesian cows [21].

5.3. Dairy, seasoning room and dairy products

At Petramartina farm, dairy consists of two distinct working units: one devoted to cheese cooling where there is a milk cooling tank, the other for its processing with a boiler, a table for curd processing and a press.

Nowadays the farm, one among Slow Food Presidia, manufactures several dairy products:

- U Cabanin: matured cheese (60 days at least) from raw milk
- Nina:, a fresh 'caciotta' from raw milk
- Velleja: a fresh ricotta (sort of cottage cheese)
- Yocab: whole white yoghurt or with honey from the farm apiary
- Mamma d'oro: a creamy cheese to spread, particularly suitable for children
- Primo sale of Cabannina a refreshing light cheese
- Squacquero of Cabannina a creamy cheese

Figure 7. Petramartina dairy.

Since when named among Slow Food Presidia, Petramartina farm has been able to produce many different dairy products from just one ingredient, milk, which meets with the recent consumers' demand for products with a characteristic taste on which they can indulge. Physiologically, Cabannina breed cannot compete with milk production from Frisian. Being its quantity of milk per lactation equal to 26-30 kg, Cabannina raw milk sale would not be economically relevant. Nonetheless, the percentages of fat (about 3.7%), proteins (about 3.3%) and lactose (5.3%) make it particularly suitable for producing very good cheese, as recently confirmed by a recent study [11]. Briefly, Cabannina breeding is now possible thanks to its highly differentiated and tasty dairy products.

5.4. Pasture management and diet

The Ligurian hinterland is characterized by small sloping plains among its woods. Cabannina cows have very strong and resistant hoofs and a low live weight (about 4.5 quintals), and can move on this territory without great difficulties. For their correct management, a breeder should divide pasture into different areas where the animals can alternatively rotate to be provided with a constant supply of organic material, to avoid excessive exploitation of vegetation and to ensure a good cleaning of the whole undergrowth. Being highly adaptive, animals of this breed graze looser most part of the year, but from February to March and from October to November, depending on the weather.

The typical diet of Cabannina cows consists of pasture forage. During winter, when kept inside in stalls, the farmer must provide their whole daily ration, based only on hay originated from areas in Aveto Valley. Lactating cows are given an integration all year long at milking time, i.e. a feed supplement specifically made for this breed derived from raw materials typical of pastures in these areas (table 10).

Such a feed has an average protein content; it is to be administered daily with fodder as much as 2% of each animal body (30% maximum according to U Cabanin production protocols).

So far no studies on Aveto Valley forage and related nutritional value have been conducted, which makes it impossible to consider how the Cabannina diet is balanced. Nonetheless, such forage is pivotal to the exploitation of this breed whose production results to be constant even though it only feed on fodder from the pasture they graze.

http://dx.doi.org/10.5772/53155

Raw materials	Analytical components T.Q.:
wheat meal	protein 15,5%
(small/young) broad beans	Oils and fat 3%
wheat bran	crude cellulose 7%
maize	ash 7%
barley	
sugar cane treacle	
calcium carbonate	
Bicalcium phosphate	
Magnesium carbonate	
Sodium bicarbonate	
farina glutinata di mais	
vitamine e provitamine (vit.A, vit.D3, vit.E, vit.B1)	
oligoelementi (Mn,Zn,Fe,Cu,I,Cb,Se)	

Table 10. Raw materials from which Cabannina special feed is derived.

6. Conclusions

Petramartina farm can be defined as a modern agro-ecology reality according to the studies performed, as highlighted through direct comparison with the fundamentals of agro-ecology by Altieri (2012) [11] (table 11):

Pertramartina Farm	Yes	No
Enhancing biomass recycling, with a view to optimizing organic matter decomposition and nutrient cycling over time.	X	
Strengthening the " immune system" of agricultural systems by enhancing functional biodiversity, natural enemies, antagonists, etc.	X	
Providing the most favorable soil conditions for plant growth, particularly by managing organic matter and by improving soil biological activity.	X	
Minimizing losses of energy, water, nutrients and genetic resources by enhancing conservation and regeneration of soil and water resources and agro-biodiversity.	X	
Diversifying species and genetic resources.	X	
Improving beneficial biological interaction and synergies among the components of agro-biodiversity, thereby promoting key ecological processes and services.	X	

Table 11. Principles of Agro-Ecology by Altieri (2012) [11]

The farm totally follows the above mentioned agro-ecological principles.

Similarly, we can compare it with the questions proposed by Koohafkan (2011) [12] (table 12):

Petramartina Farm	Yes	No
1. Do they reduce poverty?	X	
2. Are they based on rights and social equity?	X	
3. Do they reduce social exclusion, particularly for women, minorities and indigenous people?	X	
4. Do they protect access and right to land, water and other natural resources?	X	
5. Do they favor redistribution of productive resources?	X	
6. Do they substantially increase food production and contribute to household food security and improved nutrition?	X	
7. Do they enhance families water access and availability?		X
8. Do they regenerate and conserve soil and increase soil fertility?	X	
9. Do they reduce soil loss/ degradation and enhance soil regeneration and conservation?	X	
10. Do practices maintain or enhance organic matter and the biological life and biodiversity of the soil?	X	
11. Do they prevent pest and disease outbreaks?	X	
12. Do they conserve and encourage agro-biodiversity?	X	
13. Do they reduce greenhouse gas emissions?	X	
14. Do they increase income opportunities and employment?	X	
15. Do they reduce variation in agricultural production under climatic stress conditions?		
16. Do they enhance farm diversification and resilience?	X	
17. Do they reduce investment costs and farmer dependence on external inputs?	X	
18. Do they increase the degree and effectiveness of farmer organizations?	X	
19. Do they increase human capital formation?	X	
20. Do they contribute to local/ regional food sovereignty?	X	

Table 12. Questions to define an agro-ecological farm (Koohafkan, 2011) [12]

The merits of Petramartina farm are obvious, with particular reference to its strong relation with territory, animals and humans. The main economic returns of this business undoubtedly are due to:

1. a low use of water for field irrigation and for animal management in the stables;
2. a reduced consumption of fossil fuel during different stages of feed preparation and preservation.

http://dx.doi.org/10.5772/53155

Some critical points can be identified:

3. in the current lack of direct production of forage; in fact, for the winter period it has to be purchased from other local businesses;
4. hay integration through the use of a feed supplement does not fully meet the agro-ecological principles, but the issue is absolutely irrelevant when compared to its irrational use in industrial breeding.

Noticeably, Petramartina farm is soon going to implement its properties by acquiring new pastures in the aim of improving the territorial hydrogeological structure. Moreover, farming is also designed to become an essential element in promoting environmental education at any school level for the east Ligurian territory through adequate didactic structures. A further step towards preservation and spreading of Cabannina breed and its derived products, as well as the creation of new jobs in the farming and marketing areas.

Acknowledgments

Authors are particularly grateful to Mr. Ugo Campodonico, Ms. Simona Cesari and their family from Petramartina Farm for their supporting our study as well as for their pivotal role in Cabannina cow recovery in Ligurian region.

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