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in

Dubeuf J.-P. (ed.).
L'évolution des systèmes de production ovine et caprine : avenir des systèmes extensifs face aux changements de la société

Zaragoza : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 61

2004
pages 289-295

Article available on line / Article disponible en ligne à l'adresse :

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http://om.ciheam.org/article.php?IDPDF=4600116

To cite this article / Pour citer cet article

Morbidini L., Pauselli M., Burini P., Papa P. **Development of organic sheep farming systems in Umbria (Central Italy).** In : Dubeuf J.-P. (ed.). *L'évolution des systèmes de production ovine et caprine : avenir des systèmes extensifs face aux changements de la société* . Zaragoza : CIHEAM, 2004. p. 289-295 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 61)

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Development of organic sheep farming systems in Umbria (Central Italy)

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SUMMARY – Organic agriculture has been developing rapidly in recent years in Europe, particularly in Italy. About 23.6% of the lands in Europe are organically managed, while in Italy almost one million hectares are involved in organic agriculture (Willer and Yussefi, 2001) with an almost 50% growth rate of per-capita spending from 1997 to 2000. The EC Regulation 1804/99 regarding organic livestock standards was made into law by the Italian Government in August 2000. In conjunction with the Dept. of Agriculture (ARUSIA) of Umbria (a region in Central Italy), a survey was carried out on a sample of organic (or about to be organic) sheep farms. The aim was to investigate the real possibility of converting the traditional Umbrian sheep farming system to an organic one, with particular attention paid to the interests of the herdsmen. The sample group was selected from among the Umbrian sheep farms which were already certified as organic, in a phase of conversion, or had presented to the regional authority the request to convert. Fifteen farms, located throughout the region, were selected and a questionnaire was compiled with the aim of examining some of the structural and management aspects of organic farming system, as well as the transformation and commercialization of their products. The results of the study, differentiated according the productive characteristics of the farms (milk, meat and double purpose farms), highlighted some of the technical problems that arise due to the conversion process (structural changes required to adapt to organic standards, systems that are too intensive on milk-producing farms, indiscriminate use of crossbreeds, etc.) and some commercial difficulties, in all types of farms, associated with selling the products as "organic".

Key words: Sheep farming, organic, Umbria.

RESUME – *"Développement des systèmes d'élevage biologique en Ombrie (Italie centrale)". Ces dernières années, l'agriculture biologique a connu un développement rapide en Europe, et particulièrement en Italie. Environ 23,6% des terres en Europe sont cultivées de manière biologique, ce qui pour l'Italie représente 1 000 000 ha (Willer et Yussefi, 2001), avec une croissance des dépenses pro-capita d'environ 50% pendant la période 1997-2000. La Directive 1804/99 de la Communauté Européenne qui fixe les standards de l'élevage biologique a été reçue par le Gouvernement Italien en août 2000. Avec l'aide du Département pour le Développement Agricole de la Région d'Ombrie (ARUSIA) une recherche statistique sur l'élevage ovin biologique, ou en voie de l'être, a été développée. Le but de la recherche était d'évaluer la possibilité de reconvertir l'élevage ovin traditionnel ombrien en biologique, en faisant particulièrement attention aux intérêts des éleveurs. L'échantillon sélectionné comprenait des élevages ombriens déjà biologiques ou en voie de reconversion, ou qui avaient formulé à l'autorité régionale l'intention de se reconvertir en biologique. Quinze fermes, localisées dans la région, ont été sélectionnées et un questionnaire a été compilé avec le but d'examiner quelques aspects structurels et de gestion des systèmes biologiques, ainsi que la transformation et la commercialisation des produits. Les résultats de l'étude, différenciés selon les caractéristiques productives des fermes (à lait, à viande et à double aptitude) ont montré des difficultés techniques, liées à la reconversion (changements structurels à faire, systèmes d'élevage pour la production de lait trop intensifs, utilisation exagérée des métis, etc.) et des difficultés commerciales, dans tous les types d'élevages, à écouler les produits comme "biologiques".*

Mots-clés : *Elevage ovin, biologique, Ombrie.*

Introduction

Organic agriculture has been developing rapidly in recent years in Europe, particularly in Italy (Foster and Lampkin, 2000; Padel, 2001). About 23.6% of the lands in Europe are organically managed, while in Italy almost one million hectares are involved in organic agriculture (Willer and Yussefi, 2001) with a near 50% growth rate of per-capita spending from 1997 to 2000.

Compared with the other European countries, there has been a marked expansion of organic agriculture in Italy. From 1988 to 1995, the number of organic farms increased from 9% to 43%, surpassing Germany (24%) and France (14%) that had been the leaders in 1988 (Nomisma, 1997 cit. by Salghetti, 1997; Willer and Yussefi, 2001). In 2000, there were 49,188 Italians working in organic agriculture, a 12.5% increase with respect to the previous year (BioBank, 2001).

Even if the usable agricultural surface area (USA) involved in organic production did not surpass 2% of the national USA, it is still important considering that in 1988 the area involved was a mere 0.1% (MIPAF, 1996 cit. by Salghetti, 1997). The survey in 1999 involved 468 livestock farms in Italy belonging to the national certification system (BioBank, 2001). The highest concentration of these farms was located in the northern Italian region of Trentino-Alto-Adige (75 farms); 62.6% were located in the northern Italian regions, 19.6% in the southern regions, 14.1% in the central regions and only 4% on the islands (BioBank, 2001).

Organic agriculture is one of the most promising areas of the agro-food sector. In Umbria in 1999, there were 5424 more ha declared as organic (compared with 1998) and there were 841 registered organic farms (Burini *et al.,* 2001).

In Italy, as in the other EU countries, the methods of organic production were first regulated in 1991 by EC Regulation 2092/91. Organic livestock raising was defined by EC Regulation 1804/99 which extended the application of EC Regulation 2092/91, which deals with organic agriculture, to include animal production. These norms were then actuated by Ministerial Decree on August 4, 2000, No. 91436 and integrated or modified by Ministerial Decree on March 29, 2001.

The objectives of organic animal production according to EC Regulation 1804/99, regarding the production of high quality food, are: to use renewable resources in local agricultural systems, conserve both plant and animal biodiversity, reduce pollution caused by agricultural practices, maintain natural balances and safeguard the well-being of animals used in agriculture. Organic livestock raising offers livestock producers a method that respects the environment and the vital needs of plants and animals, as well as providing the possibility of qualitative differences in their products. In contrast to other livestock-producing systems in the EU (France, Spain, the United Kingdom, etc.), the system in Italy has been poorly protected by a system of labeling or certification that gives added value to the product in the commercialization phases.

The sheep sector faired well during the bovine spongiform encephalopathy (BSE) crisis due to consumer demand for alternatives to beef but it did not take full advantage of the opportunity by promoting activities that could have improved the structure of the sector. The new organic regulations have opened up new possibilities for valuing the sheep sector that is very suitable for organic production due to its structure and size.

The aim of this study was to verify the practicality of raising sheep in Umbria using organic methods with particular emphasis placed on identifying the problems. To have a representative picture of the current status of organic livestock production, a survey was conducted of the Umbrian sheep farms that were already using organic methods or that were in the process of converting to these methods.

Materials and methods

A common research program involving ARUSIA (the Regional Agricultural Agency), the Department of Animal Sciences of the University of Perugia and the Italian Association of Organic Agriculture (AIAB) was carried out in order to establish guidelines for producing dairy products from milk obtained from animals raised under an organic system.

The objective was to survey sheep farms in Umbria that raise sheep for milk and meat and that were already using organic methods or were in the process of converting to these methods.

By common agreement among the agencies involved, at the end of 2000 the sample group consisted of 15 Umbrian sheep farms, located throughout the region:

(i) In which the lands were already converted to organic methods or the request to convert had been presented to the AIAB.

(ii) That requested information about converting to an organic system from the Regional ARUSIA offices at the end of 2000.

(iii) That were already AIAB-certified organic farms (with internal norms).

A questionnaire was compiled with the aim of examining some of the structural and management aspects of an organic system, as well as the transformation and commercialization of their products. The questionnaire included information about the farm buildings and shelters, the ethnological make-up of the flocks and the average production parameters, the type of farm (meat producer = CA; meat and milk producer = CL and milk producer = LA), the milking systems used (absent, manual, mechanical and facilitated, that is, manual but done in a milking parlor) and a short description of the condition of the milking structures (lacking = none or possibly poor, sufficient = adeguate, good), the type of milk processing (absent, direct, delivered to a cheese factory); some feeding techniques and pasturing, the structures in the pastures, meat products (type of lambs produced as defined by EC Regulations 2137/92 and 461/93) and their destination (butcher, private parties, non-local salesmen, others), the types of cheeses produced and their destination (structures for marketing cheese: to local private parties, to local businesses, other).

The data were analyzed with FREQ and MEANS procedures using the SAS software (1989).

Results and discussion

Of the farms that participated in the study, 71% were located in the province of Perugia and 29% were located in the province of Terni. Of these, 14.3% were classified as meat-producing farms (CA), 21.4% as meat- and milk-producing farms (CL) and 64.3% as milk-producing farms (LA). These results are in line with earlier studies on the make-up of Umbrian sheep raising structures (Minniti and Santucci, 1985; Morbidini *et al.*, 1997) that showed the presence of double-purpose farms that is, the sheep, although not specifically milk-breeds, are milked.

The average altitude (Table 1) at which the farms were located was 490 m a.s.l. (range 180-750 m a.s.l.), the average total farm surface area (TSA) was 163 ha (range: 13-580 ha) with an average usable surface area (USA) of 11 ha (range: 10-524 ha). The average flock size was 410 head of sheep with notable variation between farms. The average estimated stocking rate (SR) was 6.2 head/ha which is in perfect conformity with the regulations (13.3 head/ha). However, some farms had a SR of about 15.1 head/ha which surpassed the organic regulations, particularly considering that, in this case, other species of animals were also being raised with the sheep.

Table 1. Some characteristics of the farms and of the flocks according to purpose

	Flock purpose			Overall	
	Meat (CA)	Dual purpose (CL)	Milk (LA)	Av.	Range
Altitude (m a.s.l.)	575	616	428	490	250-750
TSA (ha)	21.5	106	213	163	13-580
USA (ha)	15	45	154	111	10-524
Flock size (no.)	80	127	579	410	58-1100
Stocking rate (heads/ha)	6.25	3.62	7	6.2	0.9-15.1

Dividing the sample according to the productive characteristics of the farms (Table 1), those specializing in milk production (LA) were located at lower elevations (428 m a.s.l.) and had larger TSA and USA values (213 ha and 154 ha, respectively). The flocks were larger (average 579 head) with a higher SR (7 head/ha and some farms had > 15 head/ha). This is typical for raising the Sarda breed, as reported in previous studies (Minniti and Santucci, 1985; Morbidini *et al.*, 1997) in which the number of sheep in the flock is high in order to obtain greater milk production and therefore obtain greater returns in relation to the surface area. The first problem for meeting the regulation parameters involved the difficulty of finding organic feed.

The meat-producing (CA) farms (Table 1) were, on the average, found in the mid-hill regions (575 m a.s.l.), were small and had small flocks (80 head) with an average SR of 6.25 head/ha which meets the EC regulations. The double purpose farms (CL), were located at 616 m a.s.l. with a TSA of 106 ha and USA of 45 ha. This low USA value was due to an extensive presence of wastelands and wooded areas. The SR was very low (average 3.62 head/ha), which indicates an extensive livestock raising system. These different types of livestock-raising systems in Umbria have been discussed in other works and it was noted that the farms with mixed-breed sheep milked to produce quality cheeses (Morbidini *et al.*, 1997). The Sarda breed was the most common genetic type and was characteristic of all the farms specialized in milk production (43.5% of the genetic types surveyed) followed by the Appenninica breed (9%) and "Mascherina" (an Appenninica x Suffolk half-breed raised for meat) (9%) and many other crossbreeds for which the parental breeds were difficult to identify (9%). There were also other crossbreeds, with presence of milk type breeds like Comisana, Massese and Delle Langhe (13%), or meat type breeds like Bergamasca, Suffolk and Ile de France (13%) or Sopravissana (4%).

Among the farms, 29% also raised cattle, 7% raised horses, 21% raised hogs and 14% raised goats. Some species, such as goats, were also raised with organic methods, while for others, there was a spatial separation (barns and different pastures) or a temporal separation (different shelters and common pasture but used at different times). In all cases, the intention was to raise the various species with organic methods, not transgressing any of the dictates of the regulations. Such a differentiated approach to livestock raising could lead to several technical and health problems, as well as non-compliance with the overall SR requirements as indicated in Regulation 1804/99.

The average area/sheep within the structures was 1.3 m^2/sheep (range 0.2-4.9 m^2/sheep). High-density situations would naturally make it difficult to convert to organic methods even though the deadline for compliance has been extended. With respect to this parameter, it was more difficult for the CA farms (av. 0.5 m^2/head) and the CL farms (av. 0.88 m^2/head) to adapt their sheepfolds, older than those of LA ones (Morbidini *et al.*, 1997). The LA farms were more efficient and seemed to have adequate space (av. 1.6 m^2/head) with respect to the regulations for organic methods.

Fourteen percent of the farms surveyed had "lacking" milking structures, 57% "sufficient" and the remaining 29% "good". These results seem to indicate an insufficient understanding of the limits imposed by the regulations for organic production. The rating of the mechanical equipment was "good" in 64% of the cases; the structures in general (haylofts, machine shelters, etc.) were rated as "satisfactory" in 71% of the cases.

Regarding the pasture structures, almost all of the farms had external fences (78.5% had fences around the borders with an average of 5.5 lots/farm). Water was present in at least 50% of the lots. The situation improved progressively moving from CA farms (only 50% fenced, with 5.5 lots/farm and only 25% of the lots with water) to CL farms (90% were fenced but with only 3 lots/farm and 47% of the lots with water) to LA farms (76% were fenced but with 12 lots/farm, indicating a more intense rotation and a more sophisticated pasture management system, 55% of the lots had water).

The forage resources were rated as "scarce" for 21% of the farms, "sufficient" for 58% and "good" for the remaining 21% showing a worrisome, though not dramatic, pasture situation. Few resources were available on the CA farms and even less on the LA ones, while the more extensive CL farms never had "scarce" pasture.

Many of the farms provided the sheep with supplementary feeding (86%) during the year, or during part of the year, depending on the type of production. At times, the farms needed to buy commercial feed on the market and it was very difficult to find feed that was permitted under the current regulations of organic production [particularly regarding genetically modified organisms (GMOs)].

Only 50% of the lambs were given supplementary feeding at the trough and only 29% were put on pasture. In the Mediterranean areas it is said that "the lamb is made under the mother". In most cases, the lambs are kept in the barn until slaughtered, which takes place quite early. But the marked difference between the Mediterranean habits and markets and those of northern Europe regarding the raising and slaughtering of lambs has created some ambiguities in the regulations (access to pasture, when possible, even for the lambs). Pasturing of lambs is, in fact, technically possible and has good results, even in Italy (Morbidini, 1998; Morbidini *et al.*, 1999, 2001). However, in most cases, the climatic conditions during the lambing period (autumn and late winter) prevent the lambs from going out to pasture and, compared with the habits of the northern countries, lambs are slaughtered at a very early age in the Mediterranean countries.

Regarding meat production (Table 2), the number of lambs born and the sold, in relation to the number of sheep on the farm, showed an average productivity of 1.3 lambs/sheep/year. There were notable differences depending on the productive aim of the farms. The CL farms had a very low productivity (av. 1.13 lambs/sheep/year) but it was in line with what would be expected for a very extensive system. The LA farms had similar results (av. 1.26 lambs/sheep/year). The CA farms were the most productive (av. 1.4 lambs/sheep/year) with values that did not seem to be penalized by the type of organic system (less intensive) with respect to the usual productivity (1.5 lambs/sheep/year) in well conducted meat-type farms in our environment. The average weight of the lambs at the time of selling was about 12.8 kg, with notable variations depending on the productive aim of the farm: 9.0 kg live weight in LA lambs, 13.7 kg in CL lambs and 19 kg in CA lambs.

Table 2. Meat production in different purpose farms

	CA		CL		LA		Overall	
	Av.	Range	Av.	Range	Av.	Range	Av.	Range
Lambs born (no.)	97.5	95-100	156	48-280	769	400-1300	54	248-1300
Lambs sold (no.)	73.5	60-87	124	42-230	658	320-1150	460	42-1150
Lamb weight at sale (kg)	19	13-25	13.7	12-16	11.1	9-13	12.8	9-25
Productivity†	1.4	1.4-1.4	1.13	1.1-1.3	1.26	1.09-1.41	1.3	0.8-1.4

†Productivity: lambs/sheep/year.

The types of lamb products in the various raising systems are shown in Table 3 along with their commercial destination. Only 14% of the farms sold lambs on the organic market and these were lambs from the meat-producing farms (50% of the cases). The CL farm was not able to sell the lambs as organic due to the difficulties associated with the certification regulations during the various phases of transport, slaughtering, preparation and final sale.

Table 3. Lamb types and commercial destination of lambs in different purpose farms (%)

	Lamb type		Lamb market				
	Milk	Light	Butchers	Private parties	Non-local businesses	Others	As organic
CA	–	100	50	50	–	–	50
CL	33	67	–	33.3	33.3	33.3	–
LA	89	11	11.1	33.3	33.3	22.2	11.1

In other words, the effort required by the certification along the entire chain was not repaid by the market that, in two-thirds of the cases, was a local market (private customers or a local butchers).

Occasionally, the farms specialized in milk production sold organic lambs (11.1%). However, it should be noted that it was the regulations that prevented the majority of lambs from being sold as organic because the regulations prohibit weaning (and therefore selling) the lambs before 45 days. This goes against the practices of milk farms, that sell the lambs between 25 and 35 days in order to begin milking the ewes. The organic lamb market therefore offers little possibility for the farmer (due to the controls along the chain and the fact that it is almost impossible to obtain certification at this time) or for the consumer because organic lamb is almost impossible to find. One of the few places where one can find organic lamb is at agri-tourism places that are associated with organic farms. A potential outlet for organic lamb, from a commercial point of view, could derive from packaging portions of lamb and/or preparing dishes, made with organic lamb, in modified atmosphere or under vacuum with secure certification (e.g. done by associations of organic growers). This could be done by the farmers themselves and then distributed through the large-chain distributors (LCD) which are very interested in the organic meat "segment", especially during BSE crisis periods (Collepardi, 1996; Canonico, 1998).

Of the lambs that were produced (Table 3) , 64% came from milk (LA) sheep (<7 kg carcass) and the remaining 36% were light lambs (>7 and <13 kg carcass, judged according to EC Regulations 2137/92 and 461/93), which varied greatly depending on the type of farm production (lighter in CA farms, heavier in CL ones).

Regarding the milk chain (Table 4), the multiparous ewes had an average milk production of 143 kg of milk/lactation (range 10-240 kg/lactation) with variations associated with genetic type and raising intensity. The LA sheep produced 182 kg/lactation, while the CL sheep were only able to "recover" an average of 43 kg milk/lactation, with marked differences based on high genetic heterogeneity of the sheep and on environmental differences.

Table 4. Production, transformation and marketing of milk in different purpose farms

	CL		LA		Overall	
	Av.	Range	Av.	Range	Av.	Range
Milk production (kg/ewe/lactation)	43.3	10-110	182	120-240	142.5	10-240
Places in milking parlors (no.)	12	6-18	21	12-24	20	6-24
Refrigerators (no.)	1.3	1-2	1.1	1-2	1.2	1-2
Cheese factory distance (km)	20	19-21	63	10-120	54	10-120
"*Pecorino*" cheese ageing (d)	30	30-30	40	30-50	36	30-50

Among the farms with milk production, 42% transformed the milk directly into "*pecorino*" cheese (with an average aging of 36 days) and "*ricotta*", while 58% of the farms delivered the milk to a cheese factory. Dividing the sample according to production aims, it can be seen that on the LA farms only mechanical milking was used; the milk was then delivered to a cheese factory in two-thirds of the cases, while in the remaining cases, the milk was transformed directly into "*pecorino*" cheese (average aging of 40 days) and "*ricotta*". These farm-made products were sold to private customers or to retailers as non-organic products but, very interestingly, some of the cheese was sold to LCD as certified organic products (Magrini, 1998). Among the CL farms, only 33% used mechanical milking machines, the others milked manually, usually in milking parlors (33%). In contrast to the above, in 67% of the cases, the milk was processed directly into "*pecorino*" cheese, aged an average of 30 days (Table 4) and sold to private customers or local businesses (as a non organic product) or consigned to a LCD (as a certified organic product).

To complete the milk chain, it should be noted (Table 4) that all the farms used one or more refrigerators, with the CL farms having the most refrigerators. Even though these farms was closer to the cheese factory, milk transport was not convenient. Therefore, they needed more refrigeration units to control the high bacterial load that was observed (at least in a few cases). In contrast, the LA farms were the farthest from the cheese factories (average 63 km) but some of them delivered their milk to the cheese factories in order to get the greatest remuneration for their product.

Only 17% of the sheep raisers were not satisfied with their milking system, and of those, the CL farms were the least satisfied. Only a few of the on-farm cheese houses were in conformity with current regulations. This is a serious problem for many sheep raisers who transform their milk directly into cheese and is a problem that divides the sector.

Based on experience and numerous European meetings that have addressed this problem, the future of organic cheeses seems to be that of producing high quality, rare cheeses targeted for the specialty markets that are springing up throughout Europe (Le Jaouen *et al.*, 2001).

Conclusions

The following comments are divided according to the types of production.

(i) For the farms specialized in milk production (LA), the critical points seem to be:

- Excessive intensification of the raising system (elevated SR, difficulty finding organic-type feed within and outside the farm, especially protein concentrate feeds, inadequate shelter area, etc.) that must be remedied before the farms can be accepted into the system of organic certification.
- The problem of delivering and transforming milk. If the farm delivers organic milk to the cheese factory, the value of the milk should higher because it is an organic product. But if the milk is processed on the farm, it should be used to produce high quality cheeses.
- The problem of the age at which lambs are sold (the lamb cannot be weaned before 45 days) makes it very difficult to sell lambs from milk sheep as organic products. Since this difficulty exists in the entire Mediterranean basin, the norm will probably need to be modified to take this fact into consideration.

(ii) The more marginal farms, those that are double-purpose (CL), had the following difficulties:

- Structural inadequacies related to the surface area of the sheepfold (together with a certain obsolescence of the structures) that must be improved (although not immediately) according to the regulations.
- The genetic types of sheep raised. The half-breed approach that has been followed is not in the line with the concept of safeguarding biodiversity which is at the heart of the organic regulations.
- The difficulty of transforming and selling dairy products (inadequate milking parlors and cheese-making facilities that must be updated), the need to create a market for organic cheeses, the need to recover some types of cheeses that may be going extinct, etc.).
- The problems of selling lambs as organic. This can be overcome by moving beyond the local scene to areas with a more concentrated demand, by preparing the meat (portions, prepared meats, etc.) and searching out adequate commercial outlets, such as LCD (analogous to the meat farms).

(iii) The farms specialized in meat production (CA) seem to have fewer problems:

- They must make structural improvements, but it is not as urgent as in the other situations.
- There are some difficulties in selling the lambs as organic as in the preceding case.
- There are too many half-breeds as in the preceding case.
- It is very difficult to find organic feed outside the farm.

The practice of agri-tourism may soon obviate the problem of finding adequate market outlets for organic production (direct sales of the products or their use in the agri-tourism activity). On a mid- to long-term scale, the problem of marketing should be examined more closely and should be extended beyond the local level. The creation of a market that values organic products (meat and/or cheeses) could also be facilitated through producer associations that will play an important role in the development of this sector.

The organic system for raising sheep seems to be a practical way for promoting and increasing the value of farm products. For the marginal farms, this may be the only way that will allow them to survive. Already in these first phases, farms converting or attempting to convert to organic systems have encountered numerous difficulties due to updating and marketing of the products, along with excessive bureaucracy in the certification system. If this situation persists, another opportunity for promoting and valuing quality products in the zoo-technical sector may be lost.

Acknowledgments

This work was funded by the Region of Umbria. The authors are grateful to ARUSIA, AIAB and the Coldiretti UMBRA for their help.

References

BioBank (2001). *Tutti i dati sul biologico in Italia.* http://www.biobank.it.

Burini, P., Morbidini, L. and Pauselli, M. (2001). *Studio per la valorizzazione delle produzioni dell'allevamento ovino in Umbria.* http://arusia.umbria.it.

Canonico, F. (1998). *Zootecnia biologica: Aspetti normativi e valutazioni economiche della produzione di carne bovina.* Tesi di Laurea, Facoltà di Agraria, Università di Perugia.

Collepardi, P. (1996). *Aspetti organizzativi e commerciali delle produzioni biologiche in Umbria.* Tesi di Laurea, Facoltà di Agraria, Università di Perugia.
Decreto Ministeriale n. 91436 (4/8/2000) in attuazione del Regolamento CE n.1804/99 del Consiglio relativo alle produzioni animali biologiche.
Decreto Ministeriale (29/3/2001) di modifica dell'allegato 1 DM del 4 agosto 2000 in attuazione Reg. CE 1804/99 – Nuove modifiche al precedente decreto sul metodo delle produzioni animali biologiche.
Foster, C. and Lampkin, N. (2000). *Organic and in-conversion land area, holdings, livestock and crop production in Europe.* http://www.organic.aber.ac.uk/library/European_organic_farming.shtml.
Le Jaouen, J.C.L., Dubeuf, J.P. and Rubino, R. (2001). Le système de production dans le cahier des charges des fromages caprins et ovins AOP de l'Union Européenne. In: Productions Systems and Product Quality, Rubino, R. and Morand-Fehr, P. (eds). *Options Méditerranéennes, Series A,* 46: 81-92.
Magrini, B. (1998). *La filiera del latte biologico: Punti critici e prospettive di mercato.* Tesi di Laurea, Facoltà di Agraria, Università di Perugia.
Minniti, G. and Santucci, F.M. (1985). Umbria ovina*. Il Vergaro,* 11: 25-32.
MIPAF (1996). *Dati statistici delle Aziende biologiche in Italia.* http://www.politicheagricole.it/.
Morbidini, L. (1998). Tecniche di allevamento ecocompatibili e sviluppo dell'allevamento ovino. In: *Aspetti Tecnici, Gestionali, e Amministrativi dell'Agricoltura Biologica,* Zecca, F. (ed.). Ministero del Lavoro, Fondo Sociale Europeo-Univ. PG, pp. 233-240.
Morbidini, L., Pollidori, P. and Valigi, A. (1999). Carcass quality of Italian Merino derived breed lambs produced with "organic" farming systems. In: *Proceedings of the ASPA XIII Congress, "Recent Progress in Animal Production Science. 1",* Piacenza (Italy), 21-24 June 1999, pp. 598-600.
Morbidini, L., Sarti, D.M., Panella, F., Sarti, F.M., Burini, P. and Bibi, G. (1997). Indagine conoscitiva degli allevamenti ovini in Umbria. Analisi dei risultati e proposte di intervento. *L'Allevatore di Ovini e Caprini,* 12: 6-9.
Morbidini, L., Sarti, D.M., Pollidori, P. and Valigi, A. (2001). Carcass, meat and fat in Italian Merino derived lambs obtained with "organic" farming systems. In: Productions Systems and Product Quality, Rubino, R. and Morand-Fehr, P. (eds). *Options Méditerranéennes, Series A*, 46: 29-33.
Nomisma (1997). Struttura e andamento del biologico in Italia nel 1996. In: *Bio 97.* Ed. Distilleria, Forlì.
Padel, S. (2001). Conversion to organic farming: A typical example of the diffusion of an innovation? *Sociologia Ruralis,* 41(1): 40-61.
Regolamento EC n. 2092/91 del Consiglio del 24.6.1991, relativo al metodo di produzione biologico di prodotti agricoli e alla indicazione di tale metodo sui prodotti agricoli e sulle derrate alimentari.
Regolamento EC n. 2137/92 del Consiglio, del 23 luglio 1992, relativo alla tabella comunitaria di classificazione delle carcasse di ovini e alla qualità tipo comunitaria delle carcasse di ovini fresche o refrigerate, che proroga il regolamento (CEE) n. 338/91.
Regolamento EC n. 461/93 della Commissione, del 26 febbraio 1993, recante modalità di applicazione della tabella comunitaria di classificazione delle carcasse di ovini.
Regolamento EC n. 1804/99 del Consiglio del 19.7.1999, che completa, per le produzioni animali, il Reg. EC n. 2092/91 relativo al metodo di produzione biologico di prodotti agricoli a alla indicazione di tale metodo sui prodotti agricoli.
Salghetti, A. (1997). *Zootecnia biologica e territorio.* http://www.unipr.it/arpa/facvet/annali/1997/salghetti/salghetti.htm.
SAS (1989). S*AS User's Guide Version 6.* SAS, Cary, NC.
Willer, H. and Yussefi, M. (2001). *Organic Agriculture Worldwide 2001. Statistics and future prospects.* Biofach-SOL-IFOAM Publ. http://www.soel.de/inhalte/publikationen/s_74_ges.pdf.