



EIP-AGRI Focus Group

Robust & Resilient Dairy Production Systems

Mini-paper - a strong relationship between consumers and producer to make dairy farms robust and resilient: a societal and economical challenge.
Looking for synergies for a sustainable livestock production

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1 - Introduction: Societal acceptance as a precondition for a sustainable milk production in the EU

Recently, a weakening of the historically strong relationship between dairy farmers and consumers is occurring, even with different extent according to countries (Forsa Institute, 2015). The main cause could be the significant reduction of people employed in agriculture (almost moving from the countryside to the cities for well-known reasons) decreased from over the 40% at the beginning of the UE, to about the 4% of the current period. This reduction did not affect significantly the relationship between dairy farmers and consumers in the past, as at least one of the component of the three living generation in almost all the families had experience in agriculture. Running the time and changing the generations, this experience is missing out and a reduced perception of the agricultural word is occurring in the younger generations, especially in the cities. Here, also the approach to food purchase has significantly changed, moving from farmers' markets, which were usual locations where farmers and consumers personally interacted, to supermarkets, or even internet online orders, without personal links between farmers and consumers, in a consequent increasing distance between "citizen" and "countryman".

As a consequence, consumers are increasing their interest on information about the characteristics of the product and type of the production system, from its environmental impact or animal welfare (i.e. Two thirds of German milk consumers had noticed media reports about dairy production in Germany or the EU; Forsa Institute, 2015), to the guarantee of "natural" foods, without adulteration. The last point is increasing its importance in the last years, because of rise of new technology to create synthetic food to replace animal food. This increased interest, without a strong relationship between farmers and consumers and an adequate knowledge of dairy farmer's activities and services to the society, might generate some distortion in consumers' request. It has shown that a lot of consumers criticizing modern farming systems have weak knowledge about modern dairy farming practices. Such distortion of consumer request could result in solutions not feasible on farm and not economically sustainable, whit a consequent further deterioration of the relationship between farmers and consumers.

Furthermore, on 27 September 1999, the Council of Ministers for Agriculture showed clearly that agriculture in the EU was filled with more aspects than just producing sufficient and cheap food for EU citizens. The multifunctional model of EU agriculture has an important role in the economy and society as a whole. As a consequence, the requirements from the society that farmers have to fulfil are increasing. The dairy industry reacted on the the society's changing requirements not only by producing new products but also by putting on new standards on the milk production process for their consumers (DMK Milkmaster, Arla Arlagarden, Friesland Campina Focus Planet). In several circumstances, these requirements and standards have generated additional cost on the producer's site, and the added value given by farmer to such products did not always found correspondence in an economic adequate feedback in the benefit to farmers, able to compensate the increased production costs.

The liberalization of the EU milk market has put on economic pressure on dairy farmers in the EU. With growing dairy product exports on the world market, EU dairy farmers are getting into competition with nations with far lower product and production process standards (and costs). A higher volatility of milk and feedstuff prices, and often non-cost covering milk prices are one of the results of this development.

The EU tries to solve this problem in her politics. In the regulations for direct payments, rural development programs and organization of the markets CMO the EU tries to help farmers to match societal demands with agricultural production by the CAP. However, despite of efforts of dairy farmers, politics, science, dairy industry and others the increase of the rate of closing dairy farms in the EU is still ongoing (from 2007/8 to 2013/14 the number of dairy farms in the EU 27 dropped down of over the 40%; Agriculture and Horticulture Development Board, 2015). This trend increased in the last two years, after the end of quota system as a consequence of the decrease of the milk price (the average milk price in 2016 in UE was about the 25% lower than those of 2014; Clal, 2017).

To stop this trend, the relationship between farmers and consumers has to become again central. Only a strong consciousness of consumers of the role still plaid by farmers in the society, in term of services (i.e. ecosystem services, animal welfare, product quality, authentication of products, food security, etc.) will make it possible to orient the consumer request to applicable and sustainable solution on farm. At the same time, a recognized social relevant role of farmers by the society will favour their acceptance of the consumers' request, even if implying an increase in production costs.

The solution to strengthen the connection between farmers and consumers are probably not so immediate. The capability of farmers to physically meet consumers is fairly limited. Also, some of the produced milk does not show up on the consumers' table as fresh milk or as processed dairy products, but as an ingredient of other food. Any efficient solution, has to involve both the dairy and agro-food industries, with a special attention to marketing and communication, transparency for consumers and farmers and an equilibrate repartition of the value-added given by farmers to the dairy products between all the components of the production chain. Policy and regulation, intended as an extension of society as a whole, can also significantly contribute, together with research and innovation to increase the Robustness and Resilience of the dairy farms, and of the whole milk production system.

2 - Trend in the consumer requests to dairy farming system

On the milk market – which is a now globalized world market– it is not easy to identify consumers' wishes, as consumers are different in the geographical and social meaning and also evolve in the time ahead. In the EU there is a huge diversification among the consumer's demand as the culture, the habits, the heritage, the living standards of different nations are different in the 28 countries. In some contexts, consumers are interested in animal welfare, landscape maintenance, type of production, organic or conventional farming, but also in the price of the product. However, in Germany two third of the consumers answered when asked in a

representative interview that they select the milk by brand and not by price, and almost the half of them thinks that farmers do not do enough for animal welfare (Forsa Institute in 2015). In France, the society is blaming livestock and dairy farming for its negative impacts on environment, animal welfare and health risks. Here, part of the consumers disagree with a trend in breeding system through "intensification" or "industrialisation" (Delanoue et al, 2015). In the Netherlands, environmental issue is one the oldest challenges, in relation to the high animal density; other sources of controversies are related to animal welfare, now considered as the main issue, but also human health and farm size. In Denmark, the main three controversies about dairy farming are related to the use of antibiotics, animal welfare and the impact on environment; the increasing farm size is considered as a problem by the citizens. In Italy and Spain, health issues are the main source of controversy about livestock farming globally and debates about animal welfare and environment are increasing in Italy, while in Spain they remain limited within the scientific world (Delanoue et al., 2014). In Italy, farming is perceived by consumers playing a positive role in landscape and biodiversity maintenance (Faccioni et al., 2017).

For some dairy products (i.e. fresh products and cheese), there is a more direct connection between farmers and consumers, but for milk as a food ingredients (i.e. as milk powder) the connection is faint and more difficult to be perceived.

The heterogeneity of consumers request at a local level would not make illegible some general tendencies of the global, or in EU market, that have to be considered in the perspective of a near future and cannot be ignored in guiding dairy farm and production system to increase robust and resilience. The analysis of literature and current controversies coming from the population leads to the following classification of the challenges in four main topics: the environmental impacts, animal welfare, health and breeding management issues (Table 1).

Table 1: Issues of debate challenging livestock dairy farming (Delanoue et al., 2014).

Environment	Animal welfare	Health	Land use
GHG emissions	Definition	Antibiotics	Intensive management
Water pollution	Life conditions	Epizootic and herd diseases Risks	Geographic concentration
Animal feeding	Human interventions		
Use of resources (water, land)			
Nuisances (smell, noise)			

In particular, an increasing attention is paid on the environmental impact and the sustainability of dairy farming systems including greenhouse gasses emission and nitrogen and phosphor pollution. So far, dairy farming has not been in the centre of this discussion, but the ruminant methane emission and nitrogen pollution debate is increasing in the media discussions. Critical views against fast growing larger farms has also led to a growing resistance against construction of barns for big numbers of cows in some countries. On the other hand, some lifecycle approaches highlight a lower CO₂ emission per kg of milk produced from intensive dairy farming systems, compared to milk produced form extensive ones. This can be due to life cycle calculation systems, which may not take into account the carbon stock in the soil from permanent grassland and the losses in carbon stock in the soil by land use for concentrate production in the long term (Smith et al., 2010). The allocation of carbon emission to milk and to the other products of a dairy farm (i.e. meat) is often not assessed (Smith et al., 2010). Recent studies also highlighted that if ecosystem services provided by dairy farms are taken into account as farm output in the allocation of CO₂ emission, the emission of CO₂ per kg of milk for extensive systems became smaller than those of intensive ones (Bernués et al., 2017). Thus a better

standardisation of life cycle calculation for dairy farming system has to be addressed in the future research.

On the other hand, the question of sustainability of ingredients in the production chain is increasing in the agri-food industry (see i.e. the media campaign against the palm oil) and would invest in a near future also the milk sector. The progressive decrease in some dairy farming practices, such as grazing, has been recently in the centre of specific action of dairy industries because consumers perceived them as a missing element of the typical landscape, landscape maintenance and biodiversity in the Netherlands and in Denmark (The Sustainable Dairy Chain; 2017). Dairy farming, as a user of grasslands and crops, has lots of assets because it directly monitors areas with biodiversity and agro-ecological services (Ryschawy, 2013). An increasing attention is in general paid on ecosystem services of dairy farming systems. Ruminants can valorise proteins which are not usable in human nutrition (the ones from grasslands or byproducts), without competition on land-use with other food. A small but powerful animal rights scene carries their critics into the public, which puts pressure on politic, retailers and industry to react. Several international dairy companies have s activated advertising campaigns and labels to demonstrate their respect of animal welfare standard for their products (Arla; 2017). Similarly, the attention to the product's nutritional quality and authentication raised up even faster. An example is the EU regulation on nutritional composition of food, including milk (reg UE 1169/2011), or the increasing number of labels of milk produced form "pasture" feeding system, "mountain milk" production system, "hay-milk" as natural product with a higher nutritional value. These products are increasing about the 13 % their market, in spite of the reduction of more than the 30% of milk with artificial addition of healthy substances (i.e. of n-3 FA, vitamins etc.; Arena, 2016). Farmers have also to fulfil the requests from the industry, which needs specific technological target for the milk (i.e. cheese yield, sensory properties etc.)

Any request that implies a change or an adaptation in farming system rises up fast from consumers and industry, but changes require years to be run and to be financed on the farms. This leads to the need of a constant dialog between farmers and consumers, making these last aware of the time required to change a farm and of the costs that the changes implies. This discussion necessarily involves also the dairy industry and policy. Indeed, all actors in the dairy sector – including dairy farmers, processors, traders and consumers – are in one economical unit but with different interest. The general interest has to be to keep a balance in the sector and to try to make everyone guaranteed with some improvement, with minimum conflicts and finding economically rational and sustainable solution.

Will it be feasible to satisfy any request for consumers? Probably not, at the moment, but if all relevant actors work together, maybe yes in the future. In this scenario, the role of politics, advisors and scientist is crucial. The consumer's request and the farmer's needs should be looked at under a win-win approach, identifying strategies practicable on farm with the lowest possible increase of production costs (or even with their reduction), and this could lead to an increase of robustness and resilience in dairy production system. To give an example, an increased animal welfare could immediately rise production costs. I.e., the scientific advisory team for agricultural politics of the German government estimates the costs of a needed new construction to increase the animal welfare standards of overall animal production in Germany at 3-5 Billion Euro per year. (Press release University of Hohenheim 25.3.2015). However, increasing animal welfare would have positive consequence on milk yield, cow fertility and longevity of productive life, which comes back in an economical positive term to farmers, with a reduction of production costs in the medium and long term, partially compensating the initial costs. Or, again, the reduction of environmental impact by introduction in the agricultural rotation grassland (including legumes) for high quality forage production can reduce N fertilization, pesticides application and feeding costs. The cost reduction by introducing new strategies will not always compensate the input costs caused by fulfilling new standards. In many cases there will still be a financial gap which might not allow a sustainable dairy production. All relevant actors are responsible to develop and implement more strategies to fill that gap.

The societal appreciation is thus a key strategy to put one more the farmers in the centre of the attention, increasing the robustness and resilience of dairy farms, because of their reinforced role in the society. Similarly, the participation of all the actors, including policy makers would assure the identification of solution aimed to a correct distribution of income and costs all along the production chain, sharing strategies to stimulate farmers, also economically, to move to more robust and resilient dairy farming systems.

3 - A societal approach to strengthen the relationship between farmers and consumers – make consumers aware of the role of farmers and farmers aware of the wishes of consumers

To increase the robustness and resilience of dairy production system, farmers have to better highlight their central role in the society, thus their role has to be seen under a new perspective. Farming might not be perceived by society only as a bucolic activity, as the maintenance of ancestral traditions, but has to be correctly perceived as a modern entrepreneurship to produce food, in the respect of traditions, but able to give benefit and services to the society, thanks to its modernization. This can be possible only if farmers will move (directly or indirectly) to consumers, inform them of what is their work, but also listen to consumers what they expect from modern dairy farming. At the same time, consumers have to be incentivized to move to farmers, visit the farms, and explore the farming world to increase their awareness of what farmers do for the common benefit.

With this aim, several farmer's organizations make a lot of effort to offer different kinds of on farm events to consumers. Different institutions offer education schemes to farmers on how to organize and run these events. This can play an important role to keep a strong relationship between farmers and consumers and such initiative, not so diffused in UE, have to be incentivized. This is even more important in areas close to cities. However, the number of people that a farmer can reach by events on farm is quite limited. Another option is to organize events about dairy farming in the city to reach a larger public and attract the media, which can amplify the resonance of the event trough media documentary etc. (this was the case of the "milk strike" in Germany and Italy, i.e.). This type of event can generate empathy to dairy farmers from society, which is the basic for a good and strong relationship between farmers and consumers. For any kind of action it is very important to get into an open and honest dialog with consumers. It has shown not to be successful just explaining why things have to be done in a certain way. There is a growing amount of critical consumers (including experts like veterinarians and agronomists) being interested in what and how dairy farmers produce. Only if their opinion is heard and respected then a dialog and a good relationship can be realized.

Similarly, direct sell of product on farm and development of local markets (0 km?) is a strategy that can be adopted to reinforce the direct linkage between farmers and consumers, as well as tourist organizations and agritouristic activities. However, these solutions represent niches and cannot take care of the whole dairy market.

Today, the use of social media is also a powerful tool to reach a large public. Communication instruments, like blogs or social networks are increasing their use among farmers. These media are less expensive than TV advertising campaigns and can be handled directly by farmers, which are thus able to show their work and the role they have in producing food and common benefits.

Education in schools could be a helpful and more efficient tool to reach a larger public. Training programs on dairy farms (and agriculture in general) could be offered at each level of education to increase the consumer's (of today and of tomorrow) awareness of what a modern agriculture and dairy farming activity consist in and how it contributes to common services. Such training programs have to be developed and require the intervention of policy makers, which thus have to be involved necessarily in the process of reinforcing connection between dairy farmers ad consumers.

The positive image related to PDO or other official quality labels in extensive systems impacts positively the whole production chain in France (Delanoue et al., 2014). Thus, labelling can be a solution that would be able to transfer messages to a large number of consumers. To be effective, the label must be simple and any redundancy of information. Specific studies are required, involving industry and consumers to find the best way to summarize this information in a label in an effective way. Labelling can be also a powerful tool to find synergies between farmers and dairy industry, which will directly benefit of an efficient labelling strategy. At the same time, farmers capacity to transfer messages is limited compared to the marketing power of dairy industry and transmit messages of farmers through industry would be an opportunity for farmers, creating a win-win cooperation. Furthermore, labelling strategies would be effective only if adopted at a large scale, such EU. For which adoption the policy makers' involvement is needed.

Several stakeholders are involved in dairy farming, not only farmers. Many associations play a major role at several levels: their political lobbying impacts the implementation of new rules and laws; their actions towards consumers and wholesalers aim at changing the way people buy food products; their local demonstrations can stop the development of farms or the settlement of new barns. To prevent actions of whatever lobby or association conflicting with the general robustness and resilience of the dairy sector, round tables with all the stakeholders of the dairy production (consumers, farmers, dairy industries NGOs, breeders, etc.) have to take place in permanence at every level (local, regional, national UE), handled and moderated by policy makers (especially when positions are very opposite). These round tables are expected to share knowledge on the producing processes on farm and on industry and farmers' and consumers' needs and criticism. Problems have to be identified and solutions have to be developed there. Shared messages to increase robustness and resilience of dairy farming have be developed together. To ??veiculathe such messages industry media skills can be used, this cannot be the sole solution; shared messages are too strategic and important to be entrusted to industry only, without a policy control and coordination. Institutional advertising to support the dairy sector have to be envisaged. The role of scientist would be central to translate the requirement of all the stakeholders on practical action minimizing the impact on the single actor and optimizing the solutions, at both a technical and economical level. Examples can be found in Germany. National and European agricultural policies can be accompanied by science to find a fair balance between the demands of dairy farmers and consumers.

Whatever the solution, a transparent and inclusive dialog among farmers, consumers and all the stakeholders of the dairy production system is the only way to reinforce the connection between all the actors and to assure robustness and resilience to the whole sector and in particular to dairy farms. The development of the dialogue between all stakeholders leads to a better knowledge and understanding to legitimate the farmers in their roles, to show the services they deliver to the whole society, reassure consumers about what they are eating and reassure the associations about the real desire of all the members of the dairy chain to take the consumer's opinions into account and put them into practice in the production process. The most important might be to go on interchanging and communicating about all the services delivered to the society by dairy farming.

4 - An economical approach to reinforce robustness and resilience of dairy farms through the satisfaction of consumers' request.

When the consumers issues (even arranged among all actors) require changes in the farming systems, the changes often implies increased costs or immediate investments for farmers, with probably would be paid back in several years. There is a recurrent situation of an already existing deficit regarding the coverage of production costs in dairy farming in the EU. This basic deficit cannot be avoided only by introducing new standards in products or production processes which causes an understandable resistance of many dairy farmers to fulfil new requirements or work under new restrictions. In the last seven years, the EU has seen recurrent stages of an

unbalanced milk market caused by temporary overproduction of raw milk and drop in demand at the same time. This led to rapidly accelerated losses of dairy farms in most countries. In 2016, the EU commission reacted by activating several instruments like intervention and introduced a milk reduction program. In the future temporary overproduction has to be addressed by adequate instruments to avoid deep crisis on the milk market. A balanced milk market gives dairy farmers the planning reliability which is needed to fulfil the changing demands of the EU society. This could be realized by a regulatory frame that foresees and prevents extraordinary instabilities on the EU market.

To start and incite changes in production and production processes an economical support is required. This support can be addressed through subsidies (that is the usual way) or by a direct remuneration of milk, at the condition that subsidies and milk payment have to be targeted to actions increasing robustness and resilience of dairy farms. In the case of direct remuneration of milk, i.e. by introducing new parameters as indicators of winning practices for robustness and resilience.

4.1 - Proposition of new requirement (mandatory or voluntary) to receive UE funding able to move farms to a more robust and resilient systems, closer to the consumers requirement

Public subsidies from EU have been an historic tool to support farmers. Being the awareness of the multifunctional role of EU agriculture, especially for environment, the EU introduced some restrictions to reach higher amount of funding, even on the I pillar of the CAP, such as the *greening*. In a policy of restrictions of direct funding to agriculture, a larger part of the CPA budget is moving from pillar I to pillar II. This is translated in voluntary additional measures to be adopted on farm to reach extra subsidies, targeted to reduce environmental impact, increase animal welfare, biodiversity, ecological connection, etc., assessed at a regional scale according to the local needs.

This trend can be reinforced targeting specific measures at a UE level for dairy farming, focusing on those actions able to increase the robustness and resilience of dairy farms. Actions can be oriented in two directions: i) introduce specific restriction for dairy farmers to reach the I pillar subsidies totally or partially, in line with the *greening* (such as minimum surface of legumes, minimum protein self-sufficiency, minimum standards of animal welfare, etc.); ii) move a larger part of subsidies in the II pillar, targeting voluntary actions to increased value of the same indicators used for the restrictions of the I pillar or to complementary actions aimed at reinforcing robustness and resilience of dairy farms (i.e. higher number of cultures in crop rotation, increase the surface of permanent grassland, increase the quota of legumes, reduce the fuel consumption, reduce use of pesticides, minimal use of non human edible feedstuffs, investment in animal welfare, and so on). Moving a larger amount of resources from the I to the II pillar of the CAP will also allow to match efficiently the requirements of the dairy farming systems at a local scale, filling the gap among different regions and local contexts with different needs (of farmers, industry and consumers).

Several mutualistic instruments have been introduced by the Reg. EU 1305/2013 to mitigate the recurrent economic crisis for dairy farmers due to the volatility of milk price related to temporary over-production. Among these actions, the Income stabilisation tool (IST) was built up to be introduced in the II pillar rural development program as a mutualistic assurance to refund farmers in the case of dropdown of their income. However, the IST was fairly adopted by the EU countries and regions and, even when adopted, has a low success because of the scarce habitude of dairy farmers to regularly monitor their incomes through a financial balance sheet. In the future temporary overproduction has to be addressed by a major diffusion of mutualistic instruments or through targeted actions to implement the financial advice on farm, giving dairy farmers the planning reliability which is needed to fulfil the changing demands of the EU society.

To better target and coordinate specific actions to increase robust and resilient dairy production system, it can be envisaged to overcome the I/II pillar structure, moving through funding programs targeted for specific agricultural sector (i.e. dairy farming, meat, cereals, etc), at a EU, national and regional level, with increasing details and specificity of measure. National programs for the milk sector – approved by the UE commission – could be presented by the member states. The approval process can be similar and/or complementary to the rural development programs (so-called: “milk sector development program”), sharing the responsibility among all the actors of the dairy production chain. These programs should contain the whole of specific action to support the dairy sector from the I and the II Pillar of the CAP (or being themselves a new structure of EU funding in substitution to I and II pillar, and national funding elements. In the approval process the EU's overall interests and the direction of the development can be harmonized, main messages can be stated or restated and it could contribute to maintain the market balance. Within this program, also institutional public advertising to sustain dairy sectors can be realized.

In the UE member states dairy production and the trade with raw milk and dairy products takes place under very different conditions. Depending on how much trade is done in a member state on a national or international level dairy farmers are suffering from national or international imbalances of the milk market. Severe drops in revenues like in the last milk market crises do not only cut down dairy farmer's income but also disable them to fulfil consumer's demands regarding a sustainable milk production. Member states which concentrate on trade inside their country might make more use of national programs mentioned above. For member states with a higher percentage of international trade an UE wide approach is needed to prevent milk market crisis in the future and national programs have to be completed with EU programs like it has been done with the reduction program in 2016 (see COMMISSION DELEGATED REGULATION (EU) 2016/1612). The current CAP already allows the implementation of these programs. Based on Regulation (EU) No 1308/2013, article 219 the EU Commission is given the power to adopt delegated acts and implementing acts in order to start these programs. It has shown that the administrative tasks were easy to mitigate and did not lead to any hurdles in the implementation of the programme.

4.2 - Proposition of new parameters for milk quality prime to move farms to a more robust and resilient systems, closer to the consumers requirement

The current milk payment systems in UE are mainly based on a base price, to which can be added some extra prime, related to milk composition, with minimal threshold over which it is possible to reach the premium or under which penalty are applied. The parameters on which the extra prime is paid can vary, as well as the threshold, but are mainly related to industry requirements (i.e. fat, protein, casein contents, butyric spore) or milk safety (SCC, Total bacterial count).

New parameters of milk composition can be introduced to integrate (or even partially replace) the actual, basing on the scientific evidence that several milk components can be indicators of farming practices occurring to increase farm robustness and resilience and matching at the same time the general or local consumers requirements.

The milk fatty acid (FA) composition can be an example of new parameters for milk payment and are still used as voluntary additional parameter in some specific supply chains (i.e. Valorex or in Vivo; Borreani et al., 2013). The concentration of some FA has been indeed associated to feeding system and farming practices with an elevated environmental sustainability (i.e. α -linolenic is an indicator of biodiversity, rumenic acid of the use of grass derived forages and grazing practices, as well as ω -3 FA and Polyunsaturated FA; Peeters, 2012; Farruggia et al., 2014). Other FA are indicators of animal welfare (i.e. branched chain FA and the ratio between trans-10 and trans-11 isomers of C18:1 are indicators of ruminal metabolic diseases; Vlaemink et al., 2006; Comino et al., 2015). Some FA can be indicators of the concentration of concentrates of human edible feedstuffs in cow diet (i.e. ω -3 to ω -6 ratio or again C18:1trans10/C18:1trans11 ratio are related

to the starch concentration in cow feeding, which main sources are cereals; Bauman and Griinari; 2003). High concentration of polyunsaturated FA in milk has been also associated to a reduction in GHG emission (Chilliard et al., 2009). Relationships have been also shown between milk FA composition and the sensory properties of dairy products (i.e. the ratio between oleic and palmitic acids is an indicator of spreadability of butter and cheese texture, the PUFA content was associated to specific sensory notes and cheese aspect during ripening; Martin et al., 2005; Coppa et al., 2011). Milk FA composition has important implication for human nutrition, matching also the possible nutritional claim of consumers (Givens, 2010; Dilzer and Park; 2012).

Milk carotenoid content was also associated to dairy cow feeding (as an indicator of grazing, thus of environmental sustainability and landscape maintenance) and has also an impact on colour of dairy products and antioxidant capacity (Nozière et al., 2006).

These compounds can also give some useful information about dairy product authentication (Coppa et al., 2015).

To be effective these parameters have to be rapidly, easily and cheaply measures on milk, as it is now the case of milk fat, protein, casein contents, etc. New, cheap and rapid technology has been recently set for the analysis of these compounds, i.e. based on infrared spectroscopy (the same use for the routine milk analyses of the current parameter used for milk payment) (Soyeurt et al., 2011; Coppa et al., 2014; Ferrand Calmens et al., 2014; De Marchi et al., 2015). As a consequence, the introduction of such possible parameters for milk payment is feasible also under a technological point of view.

These possible new parameters can be exceptive to match consumers demand if translated in simple and easy indicators of their request (i.e. nutritional quality, environmental impact, animal welfare, etc.) to be placed on the labels of dairy products and on products in which milk is just an ingredient.

Labelling or marketing messages can be joined to the milk products and that value can be advertised only through the different products made by different processors. Therefore, the answer to consumers' demands can be transmitted to consumers by the processors. Between the farmers and the processors, the only official and legal connection is the milk-buying contract. The contract should contain all requests, including special ones, especially those related to the request of consumers and to the additional parameters for milk payment. It would make a clear picture of the transmitted consumers' demands and it would clarify the value of that request for the farmer. This is the case of the "Fair Milk" projects in Germany and in other EU countries. The contract should not only detail price, amount of milk and length of time, but also the quality standard, parameters and minimum threshold to be reached by the raw milk and can define expectations concerning milk production quantity and specifications. The contract is supposed to lay down the conditions for extras including extra fees for extra value. The farmer would be encouraged to fulfill the societal demands and also he would be able to make calculation of the cost and profit of the different requirements. The current regulation for contracting in the milk sector Regulation No. 1308/2013/EC article 148) do not deal with the extra requests that can be included in the contracts. Modification are required to give more guarantee to the farmers.

So far, contracts are not obligatory in every EU member state – only 13 countries are using obligatory contracts – since the milk package did not make it an EU wide obligation. They also do not refer to milk delivered to cooperatives. This creates a distortion of competition between producers and also between member states. In order to achieve a general impact in the EU these two points have to be changed. As a consequence contracts have to be applied in all member states between all producers and their processors (including cooperatives) for all raw milk deliveries.

The regulation should emphasize that contracts have not only to regard amount and quality of the milk but also to regard a price, which is able to cover costs of production including labor costs. Solutions are occurring to calculate the basic milk price on the base of for example feedstuffs and row material cost as well as adequate remuneration for the working hours,

adapting the milk price to monthly according to market fluctuation (Compral, 2015; Jürgens, EMB, 2017).

The Commission introduced the Milk Market Observatory, which collects the prices from the member states. The quotation is done by the national institutes and accumulated price data is sent to Bruxelles. This report contains the buying-in prices of the raw milk without further specification. After the modification mentioned above, price reports can be detailed concerning extra fees included in the price paid to the farmers. With this possibility the value of different demands would become transparent and evaluations could be done in the consumers' point of view on EU level. It would give a clear picture about the market-oriented technical improvement and would help the farmer to develop his system regarding the market needs.

Research needs from practice

Some improvement in the research and development on the dairy sector can be carried out to increase the robustness and resilience of dairy farms, under both a societal and economic point of views.

First, general and specific consumers demands should be known clearly to target the action on farm to satisfy consumers' request. This can be done by different actions, such as questionnaires, surveys, interviews, funded by specific programs at a regional, national and UE level.

Research has to be focused on standardised methods to determine the HG emission of dairy farms, taking correctly into account the long term stock and losses of carbon in the soil of permanent and temporary cultures and focusing on the allocation of the emission to all the output of the farm, including also the ecosystem services provided.

Some preliminary research is running on to identify indicators of those farming practices that can be able to satisfy consumer requests. Indicators used have to be easy to determine, clear and if possible measurable directly on milk. The aim in the end should be the consumer's better awareness, more open and transparency milk production and with the aim of introducing new criteria for milk payment. New developed standards or quality systems introduced by industry should give the added value for dairy farmers. These quality systems can be used as developing a new milk brands, products or market chain. The indicators must be simple, easily understandable and thought to be transferred to consumers through labelling of products.

The requirement of changes in regulations have also emerged, bit on labelling, which is efficient only if adopted at the largest possible scale (i.e. UE), and on milk contract, introducing the detail of new parameters in the contract and the economic detail of each specific requirement to satisfy consumers demand under both a technical and economical point of view.

Monitoring of milk market has to be increased in detail, giving feedback not only of the final milk price, but splitting it into the components related to each parameter concurring in determine it. An adequate calculation of production costs including adequate remuneration for the performed working hours has to be established (Jürgens, EMB; 2017).

Conclusions

European dairy products have got a high level of security, traceability and quality, these characteristics can make them competitive in world market. In future, more consumers will be more aware of special characteristics of the milk as a product and also the type of the production process. Sustainability of the production process might become the licence to produce milk. At the same time milk production will only have a future if it is profitable for the farmers as well as

for the dairy industry. Market price, production costs, funding will play an important role, but none of them can be the only solution for profitable milk production.

New type of research should be targeted on the aim of developing robust and resilient dairy farming systems, as well as encouraging dairy farmers to utilize those research results. To make these concrete and effective, the involvement and dialog of all the stakeholders- consumers, industry, producers, retailers and regulators - is the basis to reach reinforced societal and economic link between farmers as a primary producer and consumers as an end user. Politic on national and European level plays an important role to moderate that dialog and to set the needed framework for a fair balance of interests as a precondition for a robust and resilient dairy farming in the UE. All the proposed actions will be effective only if integrated in a general framework of actions specific for the dairy sector, at EU, national and regional level, sharing the responsibility among all the operators of the dairy sector. This will enable to make synergies among the single actions within a territory. This is a fundamental part of the strategy to increase the resilience and robustness of the dairy farms and of the dairy production as a whole.

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