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Capturing innovations in grassland-based dairy farms in Sardinia (Italy)

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Abstract. Inno4Grass is the acronym for "Shared Innovation Space for Sustainable Productivity of Grasslands in Europe", an international and multi-actor project gathering prominent farmers' organizations, extension services, education and research institutions from eight EU countries. The overall objective of the project is to bridge the gap between practice and science communities to ensure the implementation of grassland innovations at farm level. After a brief introduction about the overall structure of Inno4Grass, we will focus on the outcome of a farm survey carried out in Sardinia (Italy). Ten innovative dairy farmers were interviewed. Information was collected using a standardised questionnaire based both on farm structure parameters and on open questions covered different domains: production techniques (i.e. new grassland mixtures), products (i.e. cheese processing) and farm organization (i.e. labels and marketing). Several innovations were often identified within the same farm. Most farmers' strategies were oriented towards the reduction of production costs. Their decisions could be a good example for other potential innovators.

Keywords. Dairy farms - Grassland - Innovation - Survey.

Capturer les innovations dans les fermes laitières herbagères en Sardaigne (Italie)

Résumé. Inno4Grass est l'acronyme pour « Un espace partagé autour de l'innovation pour des prairies productives et durables en Europe», un projet international et multi-partenarial regroupant d'importantes organisations professionnelles d'agriculteurs, des établissements d'enseignement agricole et des instituts de recherche de huit pays européens. L'objectif général du projet est de combler le fossé qui sépare les communautés de praticiens et scientifiques afin de garantir la mise en œuvre d'innovations dans les prairies, à l'échelle des exploitations. Après une brève introduction sur la structure générale d'Inno4Grass, nous nous concentrerons sur les résultats d'une enquête agricole réalisée en Sardaigne (Italie). Dix éleveurs innovants ont été interrogés. Les informations ont été collectées à l'aide d'un questionnaire normalisé basé à la fois sur les paramètres de structure de l'exploitation et sur des questions ouvertes concernant le fonctionnement général de l'exploitation et les innovations spécifiques adoptées par les agriculteurs. Les innovations agricoles couvraient différents domaines : techniques de production (nouveaux mélanges prairiaux), produits (transformation fromagère) et organisation agricole (étiquettes et commercialisation). Souvent, plusieurs innovations étaient identifiées au sein d'une même ferme. La plupart des stratégies des agriculteurs étaient orientées vers la réduction des coûts de production. Leurs décisions pourraient être un bon exemple pour d'autres innovateurs potentiels.

Mots-clés. Fermes laitières – Prairie – Innovation – Enquête.

I – Introduction

The international and multi-actor project "Shared Innovation Space for Sustainable Productivity of Grasslands in Europe" (Inno4Grass) gathers prominent farmers' organizations, extension services, education and research institutions from eight EU countries. It aims at filling the gap between practice and science, focusing on grassland-based farming systems, on their status concerning innovations and on the needs for their sustainable improvement in the future. Several regimes of innovation co-exist (Joly *et al.*, 2013). The two main regimes regarding grasslands are the centralised

innovation regime and the innovation through participatory experiments. Inno4Grass approach is based upon a combination of both. Because of the high dependency on local conditions, many innovations arise from farmers as they exploit the diversity of conditions. The centralised approach makes it possible to consolidate such innovations through science and generic knowledge. Moreover, this dual approach improves the novelty and its adoption, both aspects being at the very core of innovation (OECD, 2005). A total of 170 innovative farmers were identified and interviews were carried out in the eight EU countries for different farm types (dairy, beef, sheep). These breeders were considered as lighthouse-farmers from which the less innovative farmers in Europe could learn for the adoption of farm innovations. In this paper we focus on the results collected in Sardinia.

II – Materials and methods

1. Farmers selection and interviews

Interviews were conducted in Sardinia (Italy), from September 2017 to April 2018. Ten innovative farmers were identified, either with the help of the stakeholders who had signed an endorsement letter for this purpose with the project consortium, or selected among the farmers' network of CNR-ISPAAM. Nine farms bred dairy sheep and one farm bred dairy cows.

Face-to-face interviews were carried out by setting up a specific questionnaire composed by two main sections (OECD, 2005). The first section focused on social data, environmental characteristics, farm structure, availability of grasslands and their management, livestock consistencies and animal performances. The second section focused on the farm's innovations, either directly or indirectly linked to grasslands, on the farmers' strategy that pushed the adoption of the innovation, on the benefits obtained by the farmer and on the eventual unsatisfied needs.

III – Results and discussion

The farms displayed a different organisation, depending on the site, on its characteristics and on farmers' choices. The farmers were on average 50 years old. The average surface area of the farm was 126.6 ha, ranging from 78 to 180 ha. Most of the farmland was owned by farmers.

Eight farms included temporary grasslands that covered 11 to 92% of the total farm area. Four farms were based on permanent pastures. In three cases (farms 1, 5 and 10), permanent pastures were recovered after the abandonment of annual crops (cereals). Such semi-natural pastures contained mainly annual legumes (clovers and medics), annual grasses and, sometimes, shrubs of the Mediterranean maquis. In farm 7, permanent grasslands were recovered after the abandonment of annual crops based on legume-grasses mixtures were sown.

The prevailing use of grasslands was grazing, except for farm 6 where dairy cows were stabled. Nonetheless, most grasslands were mown after the grazing season. Only in farms 3, 6 and 9, a variable portion of the grassland surface area was exclusively mown to produce hay.

Grassland-related innovations covered several domains: (i) use of innovative machinery (D1), sometimes self-built; (ii) forage mixtures or species (D2); (iii) management of the grazing system (D3); (iv) legume management (D4); (v) animal breed (D5); (vi) production of new dairy products (D6); marketing strategies (D7).

Most farmers adopted several innovations, usually a combination of two or three, which indicated a holistic approach to innovation which, in some cases, required a total change of farming system (Farms 2, 6 and 7).

-	TA	FA	PGs	TGs	eGrA	eMoA	MU	NA
Farm	(ha)	(ha)	(ha)	(ha)	(% FA)	(% FA)	(% FA)	(LSU)
Farm 1	180	180	120		66		33	45
Farm 2	150	150		55	63.3		36.7	25
Farm 3	82	77		77	54.9	19.5		55.2
Farm 4	180	160		160	10.1		89.9	79
Farm 5	90	70	60	10	85.7		14.3	26
Farm 6	200	185		185		100		498
Farm 7	79	76	59	17			100	54.3
Farm 8	78	70,5		65.5	10		90	72.5
Farm 9	180	174		161		3.3	96.7	122.1
Farm 10	120	70	34		100			40

Table 1.	Farm	structure	of the	innovative fa	arms
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TA=total farm area; FA=main forage area; PGs= permanent grasslands; TGs=temporary grasslands; eGrA=exclusively grazed area; eMoA=exclusively mown area; MU=mixed-used area; NA=number of animals in Livestock Unit.

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Farm	Domain of innovation (D)	Short description of the innovations
Farm 1	D6, D7	Several types of cheese are produced using the thistle rennet. Sales of cheese with the trade mark «qualità vegetariana». Online sales.
Farm 2	D5, D7	Breeding of a native sheep breed; farm shop; online sales.
Farm 3	D1, D4, D5	Use of a modified precision seeder. Innovative legume-cereal mixtures (pink serradella and wheat or barley). Breeding of two dairy sheep breed.
Farm 4	D5, D6, D7, D8	Breeding of three species of dairy animals (sheep, goat, cow). Production of unique cheese types (semi-seasoned cheese and unusual cheese seasoning). Farm holiday. Farm shop.
Farm 5	D7, D8, D9	Farm shop, online sales. Cheese brand (Latte nobile). Production of environmental services.
Farm 6	D1, D2, D5, D9	Sod-seeding of forage plants. Use of legume-based mixtures. Animal type (cross-breeding). Production of environmental services.
Farm 7	D2, D3, D7	Local self-reseeding legume-based mixtures (burr medic, subterranean clovers) and perennial species. Short rotational grazing. Out-of season lambing. Farm shop. Shop in the nearby town. Online marketing.
Farm 8	D2, D3, D8	Forage self-sufficiency. Forage system based on temporary grasslands as subclovers and medics in mixture with cereals. Annual cereal-legume forage mixtures (Trifolium alexandrinum or T. incarnatum or T. resupinatum). Sulla.
Farm 9	D4, D6, D7, D9	Sod seeding (Italian ryegrass on lucerne). Production of innovative cheese (also with herbs). On farm sales, farm-to-fork sale circuit with a shop in the city centre. Almost energy self-sufficient (photovoltaic panels).
Farm 10	D3, D6	100% semi-natural pasture-based milk. Agroforestry. Cross-bred sheep. New cheese processing techniques. Production of a range of dairy products.

D1=machinery, tools; D2=forage mixture; D3=grazing management system; D4=legume management; D5=animal breed or type; D6=product or product processing; D7=marketing; D8=farming system; D9=other.

The reasons that pushed farmers to adopt innovations were mainly the need to solve specific problems and to decrease production costs. Among the specific problems, improving the independence of their incomes from milk market price volatility seemed to have a great importance among farmers. Stabilising their income was one of the main drivers that pushed the adoption of innovations.

Farm	Farmers' strategy	Short description of farmers's strategy
Farm 1	S1, S4, S5	Find new niche markets for cheese (vegan/ vegetarian consumers).
		Set up new cheese processing techniques. Sell products.
Farm 2	S1, S3, S7	Produce very high-quality cheese to be sold in niche markets. Decrease milk production costs.
Farm 3	S1, S2, S3	Improve forage quality and availability. Improve sheep milk production. Decrease milk production cost.
Farm 4	S1,S4,S7	Increase the potential number of consumers (market). Increase the range of dairy products.
Farm 5	S1,S3,S5,S7	Overcome the market saturation of cheese produced from pasteurized milk. Production of healthier cheese.
Farm 6	S1,S2, S3	Save labour. Reduce costs of soil tillage. Increase environmental services.
Farm 7	S3,S7	Reduction of labour intensity for grassland management.
		Reduce the influence of milk price volatility on farmer income.
Farm 8	S1,S2,S3	Improving animal health (condensed tannins). Decreasing costs for extra-farm inputs.
Farm 9	S3,S4,S5	Stabilising income among years to plan investments. Reduce costs for soil tillage.
Farm 10	S2,S3, S5	Improve cheese yield from sheep milk. Improving dairy products quality and health. Improve income.

Table 3. Farmers' strategy (S): the drivers that push farmers to adopt innovations

S1=solving a specific problem; S2=obtaining a higher production; S3=decreasing costs; S4=processing products; S5=short market chain; S6=curiosity in the subject or technique; S7=other.

IV – Conclusions

The farmers interviewed provided examples of how farms and farmers' income can be improved using several strategies and specific innovations. The solutions that they found to solve specific problems and their implementation can serve as a guide for other farmers at local, national and trans-national scales. These farmers can be considered as a source of inspiration for other farmers who need to improve their conditions under Mediterranean climate.

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