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Durum wheat and local chains: A new strategy to strengthen locally selected genotypes

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Abstract. Wheat is the most important crop in many areas of the Mediterranean Region. In Sardinia (Western Mediterranean, Italy), this crop has been grown for a very long time. As a consequence, the Island is rich in traditional breads and pasta completely different from those that can be found in other parts of Italy and the Mediterranean. Hence, a specific regional breeding programme has been developed in Sardinia to meet the different needs of farmers, millers, end-product processors and consumers as well as to strengthen the peculiarities of the Sardinian durum wheat chain. This programme aims to release specific cultivars showing strong genotype × environment interaction (GE) to Sardinian growing conditions. At the moment, two Sardinian varieties have been released in the last years: Karalis and Ampsicora. These varieties have been grown and tested in different areas of the island together with other varieties used as a check and the main agronomic and quality traits have been analysed. Finally, these varieties have been used either in purity or in blends, to make Sardinian traditional breads and pasta. The success of this programme enabled the development of a local durum wheat chain identified by a quality brand called *Semenadura.*

Keywords. Durum wheat breeding – Local chain – Bread-making – Pasta-making.

Le blé dur et les chaînes locales : une nouvelle stratégie pour renforcer les génotypes sélectionnés localement

Résumé. *Le blé est la culture la plus importante dans de nombreuses zones de la région méditerranéenne. En Sardaigne (Méditerranée occidentale, Italie), cette plante est cultivée depuis très longtemps. Par conséquent, l'île a une richesse de pains et de pâtes traditionnels, très différents de ceux qui peuvent être trouvés ailleurs en Italie et en Méditerranée. Par conséquent, un programme spécifique d'amélioration régionale a été élaboré en Sardaigne pour répondre aux différents besoins des agriculteurs, des meuniers, des transformateurs de produits finis et des consommateurs et pour mettre en valeur la chaîne du blé dur sarde. L'objectif de ce programme est d'obtenir des cultivars spécifiques montrant une forte interaction génotype × environnement (GE) dans les conditions de culture sardes. Deux variétés sardes ont été obtenues au cours des dernières années : Karalis et Ampsicora. Ces variétés ont été cultivées et testées dans différentes zones de l'île avec d'autres variétés utilisées comme témoins et leurs principales caractéristiques agronomiques et leur qualité ont été analysées. Enfin, ces variétés ont été utilisées soit à l'état pur soit mélangées pour préparer des pains et des pâtes traditionnels sardes. Le succès de ce programme a permis le développement d'une chaîne locale du blé dur identifiée par une marque de qualité appelée Semenadura.*

Mots-clés. *Amélioration du blé dur – Chaîne locale – Fabrication du pain – Fabrication des pâtes.*

I – Introduction

Durum wheat is the most widespread crop in many areas of the Mediterranean Region. In Sardinia (Italy), this species is extensively grown in spite of a substantial reduction in recent years (Fig. 1). This downward trend is due to several reasons, not least the difficulty of finding durum wheat varieties suited to the special pedo-climatic conditions of Sardinia. To tackle this downward trend, the regional agencies, Agris and Laore, have developed an on-going project aiming to enhance a durum wheat local chain to meet the needs of farmers, millers, end-product processors, and consumers as well as to exploit the peculiarities of Sardinian durum wheat products. In fact, this

Island is rich in traditional breads and pasta that are completely different from those that can be found either in Italy or in the Mediterranean region (Figs. 2 and 3).

II – Material and methods

This project aims to find durum wheat cultivars showing strong genotype × environment interaction (GE) to Sardinian growing conditions. To achieve this goal a two-stage approach was developed: (1) choosing a reduced number of top-yielding varieties with good quality, in the short term; (2) releasing selected genotypes specifically targeted onto the local agro-ecological conditions of Sardinia, in the medium-long term. In particular, two varieties from the Agris breeding programme were released, Karalis and Ampsicora, and used in this project. The chosen genotypes were tested in experimental and extension fields all over Sardinia. After the harvest, the grain was milled and used either in purity or in blend to make Sardinian breads and pasta.

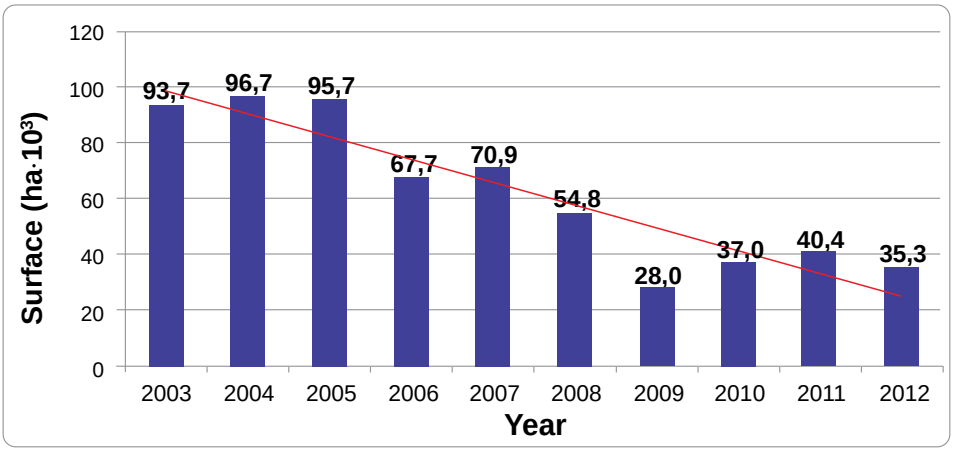

Figure 1. Trend of durum wheat surface in Sardinia (2003-12).

Figure 2. Typical Sardinian pasta: *culurgiones* (left) *and malloreddus* (right).

Figure 3. Typical Sardinian breads: *carasau* (left) *and civraxiu* (right).

III – Results and discussion

Figure 4 shows the effect of using well adapted genotypes to specific agro-ecological conditions: reducing the number and using well adapted or locally selected genotypes resulted in increasing yields across the main durum growing areas of Sardinia. Moreover, the reduction of cultivated varieties allowed a more rational storage process on the basis of protein content and gluten strength. Thus, the offer of Sardinian durum wheat is currently improving its quality standard in order to meet the needs of local millers as well as pasta- and bread-makers.

Among the cultivars currently grown in Sardinia, Karalis showed the greatest yield stability as well as excellent grain and technological quality and has been the most widely grown variety in Sardinia over the last years. Likewise, Ampsicora is rapidly spreading over the main durum growing areas of the Island.

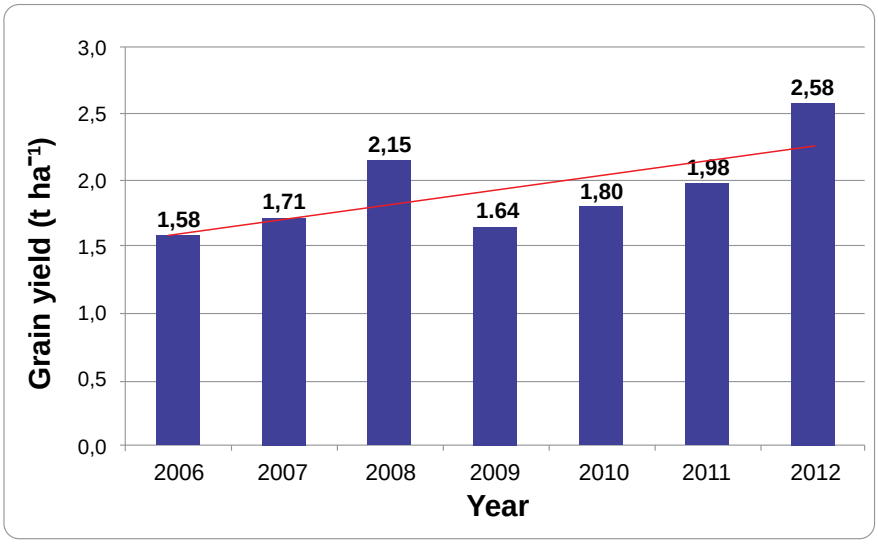

Figure 4. Trend of durum wheat yields in Sardinia (2006-12).

Quality data shown in Table 1 confirm the good quality standard of durum wheat grown in extension fields in the period 2008 to 2010. These results are remarkable given the great year-to-year variability of climatic conditions with a special focus on water supply, as well as the great soil variability due to the ancient geological origin of the island.

Table 1. Yields and data concerning grain and technological quality from extension fields in Sardinia (2008-10).

Area	Year	Protein %	Dry gluten, %	Test weight Kg/hl	Grain t/ha
Sardinia North	2008	13.5	9.2	77.2	3.14
	2009	12.3	8.6	85.1	1.97
	2010	12.1	8.1	81.0	2.55
	Mean	12.6	8.7	81.1	2.55
Sardinia South	2008	13.0	10.1	77.1	2.26
	2009	12.5	9.4	80.4	2.62
	2010	11.8	7.5	75.6	2.29
	Mean	12.4	9.0	78.0	2.36
Sardinia	Mean	12.5	8.8	79.6	2.46

IV – Conclusions

The success of this project is proven by the increasing share of local durum wheat milled and processed "on spot". Furthermore, the increasing interest of demonstrative and promotional activities resulted in the design of a quality brand addressing to this specific durum local chain. This brand is called "SEMENADURA" (*sowing* in the Sardinian language) and it will guarantee provenance and quality of typical agro-food products made of Sardinian wheat (Fig. 5).

In the future, the project will emphasize breeding activities to release high-yielding, top-quality genotypes well adapted to the Sardinian agro-ecological conditions and agronomic management to preserve the long-term soil fertility by means of conservation tillage and rotation with legumes as well as sustainability of agricultural systems (Fig. 6).

Figure 5. Two examples of the quality brand "Semenadura".

Figure 6. Cropping systems trials.