

# RICE PRODUCTION SYSTEMS IN TEMPERATE CLIMATES AND THEIR SUSTAINABILITY SISTEMAS PRODUCTIVOS DE ARROZ DE CLIMA TEMPLADO Y SU SUSTENTABILIDAD

Coordinator / Coordinador: Enrique Deambrosi, INIA

program supports university and USDA research in vital production areas, protection of the environment and quality enhancement. Finally, an industry funded research station, in collaboration with university and USDA personnel, has the pivotal responsibility of developing improved varieties which are the key to productivity and quality gains.

Research, education and aggressive participation in public policy will be the keys to solutions that will determine the future competitiveness of the California rice industry.

## THE URUGUAYAN RICE PRODUCTION SYSTEM AND ITS SUSTAINABILITY

DEAMBROSI E., Instituto Nacional de Investigación Agropecuaria (INIA), Treinta y Tres, Uruguay

An agroecosystem is an ecological system that is managed for the purposes of producing food and/or feed, and fiber. Sustainability is the capacity of agroecosystem to maintain the production through time without threatening its structure and function. Rice production in Uruguay, located between 30 and 35 parallels south latitude, is relatively new; it started in 1920 decade. Only one crop per year is grown, with risk of cold temperature occurrence during the reproductive phase of the crop. One hundred sixty thousands hectares have been seeded lately, 68% in the East, 12% in the Center and 20% in the Northwest region of the country. About 500 farmers plant varieties released in Uruguay (97,5%), using certified seed (85%). In reference to size, 31% of the farmers grow between 1-300 ha, 20% 301-500 ha, 23% 501-1000 and 26% more than 1000 ha, and production is highly mechanized. The crop is drill or broadcast seeded into dry soil (drained surface conditions). According to rainfall, flushing (1 or 2) is required to prevent water stress, before establishing the permanent flood 35-55 days after planting. Phosphorus and nitrogen, and potassium in some cases, are applied at planting. One or two nitrogen top dressings are used (tillering /panicle initiation). Type of soil, rotation system, land preparation, method and time of seeding, diseases history and weather conditions, are considered to decide crop fertilization. In general, 40-70 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> and no more than 70 kg N ha<sup>-1</sup> are applied. Although crop yield shows a slow but sustained increase in the last 15 years (4.815 kg ha<sup>-1</sup> in 1987/88; 6.704 kg ha<sup>-1</sup> in 2000/01), climatic instability and world market prices variation threaten the economic sustainability of rice production. Rice crop shares the use of soils with cattle production, accounting for 25-30% of the time. After rice harvest, it is recommended no till planting of forage species (by airplane), to increase beef/sheep production, during the period without rice (3-4 years). Grasses and legumes presence improve soil conditions, which has big impact on the next crop. Due to the shared use of the soils, rice pesticides (herbicides and fungicides) are applied with low frequency through time. Otherwise, satisfactory environmental results were found in 1992-94 in a monitoring study of pesticide residues in rice farms (soil, water and grain). Increased use of glyphosate has modified soil management, and there is a strong tendency to reduce land preparation. No tillage planting of rice at spring is also increasing, depending on the production region that is considered.

## EL SISTEMA DE PRODUCCION DE ARROZ EN URUGUAY Y SU SUSTENTABILIDAD

DEAMBROSI E., Instituto Nacional de Investigación Agropecuaria (INIA), Treinta y Tres, Uruguay

Un agroecosistema es un sistema ecológico que es manejado con el propósito de producir alimento y/o fibra. Se entiende como sustentabilidad la capacidad del ecosistema de mantener la producción a través del tiempo sin amenazar su estructura y funcionalidad. En Uruguay, ubicado entre los paralelos 30 y 35 de latitud sur, la producción de arroz es relativamente nueva habiendo comenzado en la década de 1920. Se siembra un solo cultivo por año, con probabilidad de ocurrencia de bajas temperaturas durante la fase reproductiva del cultivo. En los últimos años se han sembrado aproximadamente 160.000 ha localizadas en las regiones este (68%), cen-

tro (12%) y noroeste (20%) del país. Cerca de quinientos productores siembran variedades liberadas en el país (97,5% de la superficie), utilizando semilla certificada (85%). El 31% de los productores siembra entre 1-300 ha, el 20% 301-500 ha, 23% entre 501-1000, y 26% más de 1000 ha, con un alto grado de mecanización. Los productores siembran el arroz en líneas o al voleo, en un suelo seco (drenado en superficie). Dependiendo de la ocurrencia de lluvias, es necesario realizar 1 o 2 baños para prevenir estrés hídricos, antes de establecer la inundación permanente 35-55 días después de la siembra. Se aplica fósforo y nitrógeno basal, y en algunos casos potasio. Posteriormente se realizan una o dos aplicaciones de nitrógeno en cobertura. La fertilización se realiza de acuerdo al tipo de suelos, sistema de rotación, preparación del suelo, método y época de siembra, historia de enfermedades y condiciones climáticas. En general se aplican 40-70 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> y no más de 70 kg N ha<sup>-1</sup>. Aunque el rendimiento medio indica un lento pero sostenido incremento en los últimos 15 años (4.815 kg ha<sup>-1</sup> en 1987/88; 6.704 kg ha<sup>-1</sup> en 2000/01) la inestabilidad climática y la variación de precios en el mercado internacional amenazan la sustentabilidad económica de la producción de arroz. El uso del suelo es compartido con la producción pecuaria, ocupando el arroz 25-30% del tiempo. Luego de realizada la cosecha, se recomienda la siembra de especies forrajeras por avión, sin laboreo, para incrementar la producción de carne en el período sin cultivo de arroz (3-4 años). La presencia de gramíneas y leguminosas permite mejorar las condiciones del suelo, lo que tiene alto impacto sobre el cultivo de arroz posterior. Dado el uso compartido del suelo los plaguicidas del arroz (herbicidas y fungicidas) son aplicados con baja frecuencia a través de los años. Por otro lado, en 1992-94 se realizó un monitoreo de presencia de residuos de plaguicidas en la producción de arroz (suelos, aguas y granos), pudiéndose comprobar un estado satisfactorio desde este punto de vista ambiental. El uso creciente de glifosato ha modificado el manejo de suelos, existiendo una fuerte tendencia a la reducción del laboreo. Dependiendo de la zona de producción considerada, es también creciente la utilización de siembras con cero laboreo en la primavera.

## RICE PRODUCTION SYSTEM IN ITALY AND ITS SUSTAINABILITY

S. Bocchi<sup>1</sup>, A.M. Callegarin<sup>2</sup> and G. Baldi<sup>3</sup>

<sup>1</sup>University of Milano, Department of Crop Science, Via Celoria, 20133 Milano.

<sup>2</sup>Ente Nazionale Risi, Piazza Pio XI 1, 20123 Milano,

<sup>3</sup>University of Piacenza; Istituto di Botanica e Genetica Vegetale, Via Emilia Parmense 84, 29100 Piacenza

Sustainable Agriculture is becoming the answer to the needs of recovering the quality of rural life in industrial and post industrial societies, of conserving non renewable resources such as soil, water and air, improving biodiversity, recovering traditional and global respect towards the land. The European Rice production system along its long history has decreased progressively its similarity to the original ecosystem, becoming a very specialized and simplified agroecosystems with a low level of sustainability. After centuries during which the single, main goal has been to increase yield and after few decades of growing awareness about grain quality, few steps have taken along the way towards higher level of sustainability. This new approach is probably due to the new EU policy and a new economical and ecological perception on the part of farmers and citizens regarding the quality of natural resources, food chain and products.

The paper, after having recalled some principles related to the concept of sustainability at different complexity scales (crop, cropping system, farming system, agricultural system), describes the Italian/European rice production system and its historical, geographical, agrotechnical evolution, by taking into consideration three dimensions of sustainability: economic, environmental and social. After decades of stability, the European rice grower feels his own economic sustainability threatened by the new international trends.

The multifunctional activities and the related incomes, EU subsidizes, higher prices of special purposes and traditional rices will together make a sort of social agreement possible for the conservation of quality farming and, consequently, the conservation of natural resources.