

# 6 Rice Varietal Release Systems in Africa

**Kayode Abiola Sanni,<sup>1\*</sup> Ali A. Touré,<sup>1</sup> Aliou Diagne,<sup>1</sup> Fatimata Bachabi,<sup>1</sup>  
Rosemary Murori,<sup>2</sup> Rakesh Kumar Singh<sup>2</sup> and Moussa Sié<sup>1</sup>**

<sup>1</sup>*Africa Rice Center (AfricaRice), Cotonou, Benin;* <sup>2</sup>*International Rice Research Institute, Regional Office, Dar es Salaam, Tanzania*

---

## Introduction

National rice breeding programmes in Africa differ in strength, with some focusing only on testing lines introduced from outside, while others also conduct their own hybridization and line-development programmes targeting specific market segments and rice-growing environments in their respective countries. International partners, such as Africa Rice Center (AfricaRice), International Rice Research Institute (IRRI), International Center for Tropical Agriculture (CIAT), Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) and International Institute of Tropical Agriculture (IITA) have backstopped and contributed to rice varietal development in Africa since 1960 (see Tollens *et al.*, Chapter 1, this volume).

Countries also differ greatly with respect to seed regulation. Seed regulation encompasses two basic areas: seed quality control (certification) and variety regulation. Variety regulation primarily seeks to control the release of new varieties developed by public and private breeding programmes for seed production and marketing. National seed laws establish national seed boards (councils, authorities) that govern varietal release regulations. Common features of varietal release regulations are the establishment

of: (i) a mandatory procedure for testing varieties proposed for release; (ii) a national varietal release committee (NVRC), which recommends or rejects release based on test results; and (iii) an official register of released varieties, recording names and main agronomic characteristics of varieties that have successfully passed the tests and have been recommended for release (Louwaars, 2002). An officially released variety is a new variety that has been tested according to the standards of a country and recommended by the NVRC of that same country to be of proven value, registered and made available to the public.

In practice, some African countries keep a register of varieties that are 'adopted' in their country, because they do not operate a varietal release mechanism covering the three features mentioned above. In that case, 'adopted varieties' are those that are widely cultivated and for which the country has deemed it important to include them in the national crop register.

If international standards (UPOV, 1978, 1991) are followed, new varieties can only be registered if they satisfy four criteria: novelty or value for cultivation and use (VCU), distinctness, uniformity and stability. Distinctness, uniformity and stability are often referred to as a group: the 'DUS criteria'.

---

\* Corresponding author: k.sanni@cgiar.org

Novelty means that the new rice variety performs better than the existing varieties for one or more traits of agronomic or technological importance. The VCU of a new variety is tested and compared to local check varieties using standard protocols measuring key agronomic data such as yield, growth duration, grain quality, and resistance to biotic and abiotic stresses.

Distinctness means that the variety is visually distinguishable from existing registered varieties in one or more morphological (shape, colour, height, leaf length, etc.) and agronomic (disease resistance, growth duration, etc.) traits.

Uniformity or homogeneity means that at any development stage all individual plants are identical for all plant characteristics.

Stability means that the variety remains identical to its initial description in its essential characteristics after repeated cycles of reproduction or propagation.

There are ongoing efforts to harmonize regulations for registration of varieties, for seed trade across borders, and for phytosanitary documents needed for seed movement across Africa, by the Economic Community of West African States (ECOWAS), the East African Community (EAC) and the South African Development Community (SADC). These efforts aim at encouraging seed system development to broaden the choice of varieties and enhance accessibility to and quality of seeds for farmers.

In the ECOWAS region, the harmonization system has started with a regional varietal catalogue published in 2008. Common crop variety release systems, seed certification standards and accreditation of seed producers, quarantine pest lists and seed import–export manuals are being prepared. EAC also maintains a regional catalogue of varieties released in different member countries and is in the process of finalizing common seed certification standards and accreditation of seed producers. In the SADC region, a regional varietal release system has existed since 2009. A common quarantine pest list, seed import–export manuals, seed certification standards and accreditation of seed producers, and seed tests using International Seed Testing Association (ISTA) rules as a common standard have been established. SADC is most advanced in the harmonization process.

This chapter provides an overview of the degree to which varietal release systems are in

place in Africa and to what extent they are functional at the national level. It also provides an overview of rice varieties released or adopted (in case of absent or non-functional varietal release systems) in Africa since 1960.

## Methodology

Questionnaires were sent out to AfricaRice collaborators from national agricultural research institutes of 30 African countries in 2010, asking for information on the procedures for varietal release in their respective countries and to provide an update on varieties released or adopted since 1960. Participating countries are listed in Tables 6.1 and 6.2. The data from this survey were complemented with information contained in the national and regional catalogues of varieties, published literature and information available from the International Network for Genetic Evaluation of Rice (INGER-Africa) in AfricaRice.

## Results and Discussion

### Rice varietal release systems in Africa

National seed boards are responsible for convening and chairing the NVRC meetings and generally meet once a year. However, some committees may not meet for several years for a variety of reasons (financial constraints are often mentioned). The functionality of the varietal release system in a country can be assessed by considering whether or not its NVRC meets to assess and recommend varieties for release before those varieties are made available to the public.

We classified countries into four groups based on: (i) the existence of a varietal release system (comprising varietal testing, regular NVRC meetings to judge test results and official varietal registration); (ii) functionality of the varietal release system; and (iii) existence of at least a varietal register in the absence of a varietal release system.

Of the 30 countries surveyed (Table 6.1), 18 have a varietal release system in place (Groups 1 and 2). Of these, 13 have regular NVRC meetings (Group 1; although Gabon has yet to release any rice variety), and 5 countries have non-effective

**Table 6.1.** Rice varietal release systems in 30 African countries.

Country	Existence of varietal release system	Release system functional?	Registration required for growing commercially	Existence of varietal register	Registration required for certified seed sale	Varietal descriptor part of registration process
Group 1						
Ghana	Yes	Yes	No	Yes	Yes	Yes
Burkina Faso	Yes	Yes	Yes	Yes	Yes	Yes
Côte d'Ivoire	Yes	Yes	Yes	Yes	Yes	Yes
Egypt	Yes	Yes	Yes	Yes	Yes	Yes
Ethiopia	Yes	Yes	Yes	Yes	Yes	Yes
Gabon	Yes	Yes	Yes	Yes	Yes	Yes
Kenya	Yes	Yes	Yes	Yes	Yes	Yes
Mali	Yes	Yes	Yes	Yes	Yes	Yes
Mozambique	Yes	Yes	Yes	Yes	Yes	Yes
Nigeria	Yes	Yes	Yes	Yes	Yes	Yes
Senegal	Yes	Yes	Yes	Yes	Yes	Yes
Tanzania	Yes	Yes	Yes	Yes	Yes	Yes
Uganda	Yes	Yes	Yes	Yes	Yes	Yes
Group 2						
Benin	Yes	No	No	Yes	Yes	Yes
Burundi	Yes	No	Yes	Yes	Yes	Yes
Democratic Republic of Congo	Yes	No	Yes	Yes	Yes	Yes
Madagascar	Yes	No	Yes	Yes	Yes	Yes
Mauritania	Yes	No	Yes	Yes	Yes	Yes
Group 3						
The Gambia	No	n/a	No	Yes	No	Yes
Guinea-Bissau	No	n/a	No	Yes	No	Yes
Liberia	No	n/a	No	Yes	No	Yes
Niger	No	n/a	No	Yes	No	Yes
Republic of Congo	No	n/a	No	Yes	No	Yes
Rwanda	No	n/a	No	Yes	No	Yes
Sierra Leone	No	n/a	No	Yes	No	Yes
Guinea	No	n/a	No	Yes	Yes	Yes
Group 4						
Cameroon	No	n/a	No	No	No	n/a
Central African Republic	No	n/a	No	No	No	n/a
Chad	No	n/a	No	No	No	n/a
Togo	No	n/a	No	No	No	n/a

n/a = not applicable.

NVRCs (the committee exists on paper but is not yet functional; Group 2). Eight countries do not have a varietal release mechanism, but operate a varietal register (Group 3), and 4 countries lack both a varietal release system and a varietal register (Group 4).

In countries without a formal varietal release system, varietal registers are made up of

varieties that are already being cultivated and are recognized as such by the authority maintaining the register, e.g. the ministry of agriculture, the national seed board or the national agricultural research institute. Feedback obtained from the national partners indicated that there is considerable variation in consistency and

**Table 6.2.** Current status of application of DUS and VCU requirements for varietal release and registration in 30 African countries.

Country	Published DUS protocols	DUS required for rice varietal release or registration	Published VCU protocols	VCU required for rice varietal release or registration	Data from other countries allowed	PVS data accepted for release
<b>Group 1</b>						
Ghana	Yes	Yes	Yes	Yes	No	No
Burkina Faso	No	Yes	No	Yes	No	Yes
Côte d'Ivoire	No	Yes	No	Yes	No	No
Egypt	Yes	Yes	Yes	Yes	No	No
Ethiopia	Yes	Yes	Yes	Yes	No	No
Gabon	No	Yes	No	Yes	No	Yes
Kenya	Yes	Yes	Yes	Yes	No	No
Mali	No	Yes	No	Yes	Yes	Yes
Mozambique	No	Yes	Yes	Yes	Yes	Yes
Nigeria	No	Yes	Yes	Yes	No	Yes
Senegal	No	Yes	No	Yes	No	Yes
Tanzania	Yes	Yes	Yes	Yes	No	No
Uganda	Yes	Yes	No	Yes	Yes	No
<b>Group 2</b>						
Benin	No	Yes	No	Yes	Yes	Yes
Burundi	No	Yes	No	Yes	No	No
Democratic Republic of Congo	No	Yes	No	Yes	No	Yes
Madagascar	Yes	Yes	Yes	Yes	No	No
Mauritania	No	Yes	No	Yes	No	No
<b>Group 3</b>						
The Gambia	n/a	No	No	No	No	n/a
Guinea-Bissau	n/a	No	No	No	No	n/a
Liberia	n/a	No	No	No	No	n/a
Niger	n/a	No	No	No	No	n/a
Republic of Congo	n/a	No	No	No	No	n/a
Rwanda	n/a	No	No	No	No	n/a
Sierra Leone	n/a	No	No	No	No	n/a
Guinea	n/a	No	No	No	No	n/a
<b>Group 4</b>						
Cameroon	n/a	n/a	No	n/a	No	n/a
Central African Republic	n/a	n/a	No	n/a	No	n/a
Chad	n/a	n/a	No	n/a	No	n/a
Togo	n/a	n/a	No	n/a	No	n/a

n/a = not applicable.

accuracy among countries in keeping the varietal register up to date. Some countries do not promptly update their varietal register when new varieties are released or adopted.

Official release of a variety is required before it can be grown commercially (grown for sale) in all the countries with a release system, except Benin and Ghana (Table 6.1).

Most West African countries have sent their varietal register to be included in the West African catalogue of plant species and varieties. In East Africa, Kenya, Tanzania and Uganda have included their varieties in the EAC list of crop varieties.

The registration of varieties in the national varietal catalogue is required for the sale of

certified seeds in all 18 countries with a varietal release system. Since the other countries do not have a varietal release system, this condition is not applicable to them.

Table 6.2 provides an insight into requirements with respect to varietal release in the 30 surveyed countries. In the 18 countries with varietal release system (Groups 1 and 2), DUS and VCU information are needed for a new rice variety to be released and registered, but only seven countries have published protocols for the conduct of DUS testing and just eight countries have published protocols for VCU testing. In countries without protocols, the new varieties are compared with the best existing variety for the targeted traits to decide whether or not they will be released.

The list of traits measured for VCU (grain yield, disease resistance, plant height, etc.) and DUS (shape, colour, height, leaf length, etc.) varies across countries. Tests are repeated for at least two or three seasons. Requirement for the number of locations depends on the environment for which the variety is being recommended.

In most countries, the national seed board is responsible for assembling and conducting national performance trials (NPTs) from which VCU and DUS data are obtained. Once the VCU and DUS data have been recorded, they are then submitted to the NVRC for consideration. In Kenya, Tanzania and Uganda, the NPTs are conducted by the national seed boards for a set fee, and this may hinder some breeders from submitting their varieties, especially in the public sector.

To complement the VCU data from NPTs, independent trials, grown on farmers' fields by the farming community are required. Some countries – such as Benin, Mali, Mozambique and Uganda – accept VCU and DUS data from other countries with similar agro-ecological conditions to complement in-country data.

Agronomic data collected by breeders and socio-economic information from participatory varietal selection (PVS) are acceptable as credible VCU data for varietal release in eight countries.

### **History of rice varietal release/adoption in Africa**

Between 1960 and 2010, over 700 rice varieties were released or adopted in sub-Saharan Africa (Table 6.3). The number of varieties released/adopted varied between countries and years.

A total of 250 varieties were released between 1960 and 1990, i.e. about 8 per year. This increased to an average of 16 per year during the next decade (1991–2000), reaching 29 varieties per year in the period 2001–2010, with more countries progressively becoming involved in rice research and development.

The highest number of varieties released between 1960 and 2010 was in Burkina Faso (64), followed by Mali (62), Nigeria (57), Côte d'Ivoire (56) and Senegal (50). Rice cultivation is just taking off in Gabon and the country has not yet officially released any rice variety. The relatively high release rates in Burkina Faso, Mali, Nigeria, Côte d'Ivoire and Senegal are probably related to their long histories of rice cultivation and relatively advanced varietal release systems compared to other countries (they are all Group 1 countries). Another factor could be that some countries, such as Mali, accept agronomic data from other countries with similar growing conditions to complement their own data. Although the countries of East Africa are well advanced in their seed and varietal release systems, they have not yet released large numbers of varieties because rice only recently became a major crop in the region. Egypt is the most advanced in terms of rice production, but not many varieties have been released (only ten), because the country has a system in place that ensures that only a limited number of varieties are released over a period of time.

Varieties were released for four rice-growing agroecosystems: upland, rainfed lowland, irrigated lowland and mangrove. Of the released varieties, the largest number of varieties was released for upland systems (34%), followed by irrigated lowland (31%), rainfed lowland (24%) and mangrove (9%), while the growth environment is not known for 2% of the varieties.

## **Conclusions**

The survey results show that varietal release systems differ greatly among countries in sub-Saharan Africa. Countries could be classified into four groups, based on the existence and functionality of the varietal release system and, in the absence of a varietal release system, whether a varietal register exists. Thirteen of the 30 countries surveyed had a functional varietal release system (Group 1 countries).

**Table 6.3.** Varietal release/adoption history by country and rice-growing environment in 30 African countries between 1960 and 2010.

Country	Irrigated				Rainfed lowland				Upland				Mangrove				Total	Source of information
	Pre-90	91 to 00	01 to 10	NA	Pre-90	91 to 00	01 to 10	NA	Pre-90	91 to 00	01 to 10	NA	Pre-90	91 to 00	01 to 10	NA		
<b>Varieties released by country</b>																		
Burkina Faso	3	1	0	0	20	9	4	0	18	6	3	0	0	0	0	0	64	ECOWAS (2008); survey through national partner
Côte d'Ivoire	7	5	2	0	8	1	2	0	13	14	4	0	0	0	0	0	56	ECOWAS (2008); MINAGRI (2002); CNRA (2011); survey through national partner
Democratic Republic of Congo	0	1	2	0	0	2	1	0	1	1	11	0	0	0	0	0	19	Survey through national partner
Egypt	2	9	2	0	0	0	0	0	0	0	0	0	0	0	0	0	13	Survey through national partner
Ethiopia	0	0	0	0	0	0	1	0	0	0	4	0	0	0	0	0	5	Survey through national partner
Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Survey through national partner
Ghana	1	1	11	0	6	1	11	0	0	0	10	0	0	0	0	0	41	ECOWAS (2008); survey through national partner
Kenya	0	0	7	0	0	0	0	0	0	0	5	0	0	0	0	0	12	KEPHIS (2010); survey through national partner
Madagascar	0	0	16	0	0	0	0	0	0	0	6	0	0	0	0	0	22	Survey through national partner
Mali	9	4	11	0	3	0	11	0	1	0	10	6	5	0	2	0	62	ECOWAS (2008); survey through national partner
Mauritania	3	3	6	0	1	0	0	0	0	0	1	0	0	0	0	0	14	ECOWAS (2008); survey through national partner
Mozambique	0	4	0	0	0	4	0	0	0	0	0	0	0	0	0	0	8	Survey through national partner
Nigeria	13	1	1	0	18	0	2	0	18	0	3	0	1	0	0	0	57	Guei and Traoré (2001); NACGRAB (2009)
Senegal	2	5	23	0	5	4	0	0	3	1	2	0	1	3	1	0	50	ECOWAS (2008); survey through national partner
Tanzania	6	0	2	0	0	0	0	0	0	0	6	0	0	0	0	0	14	Survey through national partner
Uganda	0	0	0	0	0	0	0	0	0	4	6	0	0	0	0	0	10	Survey through national partner
Sub-total	46	34	83	0	61	21	32	0	54	26	71	6	7	3	3	0	447	
<b>Varieties adopted by country</b>																		
Benin	3	1	0	0	6	2	2	0	3	5	0	0	0	0	0	0	22	MAEP (2011)
Burundi	0	0	0	0	0	0	0	0	1	5	9	0	0	0	0	0	15	Survey through national partner

Central African Republic <sup>a</sup>	2	1	0	0	0	0	1	4	2	0	0	0	0	1	0	0	11	Survey through national partner
Chad <sup>a</sup>	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4	Guei and Traoré (2001); survey through national partner
The Gambia <sup>a</sup>	8	4	1	0	2	0	0	0	2	0	5	0	1	4	2	0	29	ECOWAS (2008); survey through national partner
Guinea <sup>a</sup>	0	0	0	0	3	5	6	0	0	4	5	0	7	6	0	0	36	Dalton and Guei (2003); survey through national partner
Guinea-Bissau <sup>a</sup>	0	0	0	0	1	2	0	0	0	5	1	0	2	13	0	0	24	Survey through national partner
Liberia <sup>a</sup>	0	0	0	0	0	0	2	0	7	3	5	0	0	0	0	0	17	Guei and Traoré (2001); survey through national partner
Niger <sup>a</sup>	4	4	4	0	0	0	3	0	0	0	1	0	0	0	0	0	16	ECOWAS (2008); survey through national partner
Republic of Congo <sup>a</sup>	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3	Survey through national partner
Rwanda <sup>a</sup>	0	0	12	0	0	0	8	0	0	0	0	0	0	0	0	0	20	ISAR (2010)
Sierra Leone <sup>a</sup>	7	0	0	0	6	0	2	0	8	1	6	0	6	2	6	0	44	ECOWAS (2008); survey through national partner
Togo <sup>a</sup>	1	1	3	0	0	0	5	0	0	1	0	4	0	0	0	0	15	ECOWAS (2008); survey through national partner
Sub-total	25	11	23	0	18	9	29	4	23	28	37	4	16	26	8	0	261	
Total	71	45	106	0	79	30	61	4	77	54	108	10	23	29	11	0	708	

<sup>a</sup>Countries without varietal release system; NA = not available.

Varietal testing and release systems in sub-Saharan Africa are fragmented, which makes the system overall costly and prone to duplication – since the same variety is often tested in all countries where it is being targeted for marketing. Also, most national varietal catalogues are not updated regularly, which makes it difficult for seed companies and farmers to keep up to date with every improved variety. It is not surprising, therefore, that seed systems in Africa are

underdeveloped and access to good performing (rice) seed is still a major issue and constraint (see Bèye *et al.*, Chapter 14, this volume).

To increase rice production in sub-Saharan Africa, well-coordinated rice breeding efforts (see Kumashiro *et al.*, Chapter 5, this volume), functional national varietal release systems, and regional efforts to facilitate seed trade across borders are essential.

## References

- CNRA (2011) *Repertoire des acquis de recherche du CNRA*, Tome 2: *Cultures vivrières*. Centre National de Recherche Agronomique, Abidjan, Côte d'Ivoire.
- Dalton, T.J. and Guei, R.G. (2003) Productivity gains from rice genetic enhancements in West Africa: countries and ecologies. *World Development* 31(2), 359–374.
- ECOWAS (2008) Rice [*Oryza sativa* (L.) and *Oryza sativa* (L.) × *Oryza glaberrima* Steud.]. In: *West African Catalogue of Plant Species and Varieties*. Food and Agriculture Organization of the United Nations, Rome, Italy.
- Guei, R.G. and Traoré, K. (2001) New approach to germplasm exchange for a sustainable increase of rice biodiversity and production in Africa. *International Rice Commission Newsletter* 50, 49–58.
- ISAR (2010) *Description of New Rice Varieties Introduced in Rwanda*. Rwanda Agricultural Research Institute, Kigali, Rwanda.
- KEPHIS (2010) National Crop Variety List – Kenya. Kenya Plant Health Inspectorate Service, Nairobi, Kenya.
- Louwaars, N.P. (2002) Variety controls. In: Louwaars, N.P. (ed.) *Seed Policy, Legislation and Law: Widening a narrow focus*. The Haworth Press, New York, pp. 131–142.
- MAEP (2011) Riz [*Oryza sativa* (L.) et *Oryza glaberrima* (Steud.)]. In: *Catalogue Béninois des Espèces et Variétés Végétales (CaBEV)*. Imprimerie ATG, Cotonou, Benin.
- MINAGRI (2002) *Catalogue officiel des variétés de riz*. Ministère de l'Agriculture, Abidjan, Côte d'Ivoire.
- NACGRAB (2009) Rice (*Oryza sativa*). In: *Crop Varieties Released and Registered in Nigeria*, No. 2. Xavier Communications, Ibadan, Nigeria.
- UPOV (1978) *Act of 1978: International Convention for the Protection of New Varieties of Plants of December 2, 1961, as Revised at Geneva on November 10, 1972, and on October 23, 1978*. Available at: [www.upov.int/export/sites/upov/upovlex/en/conventions/1978/pdf/act1978.pdf](http://www.upov.int/export/sites/upov/upovlex/en/conventions/1978/pdf/act1978.pdf) (accessed 4 February 2013).
- UPOV (1991) *Act of 1991: International Convention for the Protection of New Varieties of Plants of December 2, 1961 as Revised at Geneva on November 10, 1972, on October 23, 1978, and on March 19, 1991*. [www.upov.int/export/sites/upov/upovlex/en/conventions/1991/pdf/act1991.pdf](http://www.upov.int/export/sites/upov/upovlex/en/conventions/1991/pdf/act1991.pdf) (accessed 4 February 2013).