Research Application Summary

Performance of introduced irrigated rice varieties in Ruzizi plain, South Kivu province, DR Congo

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Abstract

In the frame work of the rice production intensification by IFDC project in Ruzizi plain in the Sud Kivu province, DR Congo, The Catholic University of Bukavu (UCB) and Evangelical University in Africa (UEA) are collaborating in research to develop high yielding irrigated rice varieties in Ruzizi plain. This is necessary in order to increase rice production to substitute importation of malt. Increasing rice production in Ruzizi plain will also contribute to food security and poverty alleviation for farmers. Trials were carried out in a randomised block design with 3 replications in 4 irrigated rice areas, i.e., Luvungi, Luberizi, Sange and Kiringye. Twenty four introduced varieties and 3 local varieties were evaluated. Two varieties among the 24 introductions yielded up to 8 tons per ha while five yielded up to 7 tons per ha. The local varieties yielded 2.5 tons per ha or less. The highest yield was recorded from Luberizi. The introduction; RW 17, RW 5, RW 9, RW 13 and V 27 yielded between 7.5 and 8 tons per ha. These varieties have low spikelet sterility and can thus be recommended to farmers. Fertilisation trials are also under way to assess potential of these lines for breeding purposes.

Key words: DRC, rice production, Ruzizi plain, yield

Résumé

Dans le cadre de l'intensification de la production du riz par le projet IFDC dans la plaine de la Ruzizi,située dans la province du Sud Kivu, en République Démocratique du Congo, l'Université Catholique de Bukavu (UCB) et l'Université Evangélique en Afrique (UEA) collaborent dans la recherche pour développer des variétés de haut rendement de riz irrigué de la plaine de la Ruzizi. Ceci est nécessaire afin d'augmenter la production du riz pour remplacer l'importation du malt. L'augmentation de la production du riz dans la plaine de la Ruzizi contribueraégalement à la sécurité alimentaire et à la réduction de la pauvreté pour les agriculteurs. Des essais ont été effectués dans un dispositif en blocs aléatoires avec 3 répétitions en 4

zones de riziculture irriguée à savoir, Luvungi, Luberizi, Sange et Kiringye. Vingt-quatre variétés introduites et 3 variétés locales ont été évaluées. Deux variétés parmi les 24 introductions ont donné un rendement jusqu'à 8 tonnes à l'hectaretandis que cinq ont donné un rendement jusqu'à 7 tonnes à l'hectare. Les variétés locales ont donné un rendement de 2,5 tonnes à l'hectare ou moins. Le rendement le plus élevé a été enregistré à Luberizi. Les introductions RW 17, RW 5, RW 9, RW 13 et V 27 ont donné un rendement entre 7,5 et 8 tonnes à l'hectare. Ces variétés ont la faible stérilité des épillets et peuventainsi être recommandées aux agriculteurs. Des essais de fertilisation sont également en cours pour évaluer le potentiel de ces lignées à des fins de reproduction.

Mots clés: RDC, production de riz, plaine de la Ruzizi, rendement

Background

Ruzizi plain covers 1,750 km^2 and is shared between Rwanda, Burundi and DRC; it is called Imbo plain in Burundi, Bugarama plain in Rwanda and Ruzizi plain in DRC, Ruzizi river being the natural border for the three countries. In DRC, the plain covers 80,000 ha. Of these, 14,000 ha are allocated to about 45,000 farmers for rice cultivation. The remaining is covered by pasture (35,000 ha) and marshes (30,000 ha).

Ruzizi main river has several tributaries on which irrigation infrastructure had been set. The infrastructures are currently defective and do not permit proper irrigation. The area receives ample sunshine, with the maximum during the dry season. Soils are sandy, with a mixture of recent alluvial materials. Rice, maize, groundnut, beans, soybean, tomatoes and vegetables are the other main crops in the planes (IFDC Catalist, 2008). However, there is widespread demand to intensify rice production, hence the need to identify high yielding varieties.

Literature Summary

Rice production has never satisfied demand in DRC. Rice yields are low (0.755 t/ha) compared to African and world means. The civil unrest in the last ten years has made it worse, forcing the country to import rice from Asian countries (Banque Centrale du Congo, 2010).

In South Kivu province, rice is cropped in all administrative areas, mainly in Shabunda where rain-fed rice is cropped. Irrigated rice is cropped mainly in Ruzizi plain, where yields of local varieties do not generally exceed 2.5 t/ha. Although enormous potential for rice production exists in the Ruzizi plain

rice, from this part of the country does not appear on the market. Principal constraints are low productivity, lack of secured market, weakness of farmer organisations, high cost of labor, lack of interaction among stakeholders, lack of financial credit and defective irrigation infrastructure.

There are opportunities for intensifying rice production in the plain. These include presence of market, interest of national and local Governments and NGO's in increased rice production and distribution of agricultural machinery by the government.

Among local varieties are SIPI and IRON,. These have been grown since 1964 and yield less than 2.5 t/ha. In addition these are long maturity period varieties (up to 6 months), therefore cannot be grown more than once in a year

Study Description

This study was carried out from November 2010 to May 2011, in four rice growing areas of the Ruzizi plain, South Kivu Province, DRC. The trials were designed as complete randomised blocks and replicated 3 times. In addition to the 24 introduced varieties from ISAR Rwanda and ISABU Burundi, 3 local varieties namely SIPI, IRON and KAMUTI were included in the study (Table 1).

Table1. Distribution of introduced varieties among experimental sites.

Experimental sites	Origin of varieties	
	ISAR Rwanda	ISABU Burundi
Luvungi	RW 3, RW 19, RW 7, RW 11, RW 15	V 18
Luberizi	RW 1, RW 5, RW 9, RW 13 et RW 17	V 14
Kiringye	RW 2, RW 6, RW 10, RW 14, RW 18	V 27
Sange	RW 4,RW 8, RW 12, RW 16 et RW 20	CR 009

Rice was transplanted into the field 18 days after germination and spaced at 20 x 20 cm with 2 plantlets per hill. Experimental plots measured 2 x 2 m. Water was maintained at a depth of 15 cm a few days after transplanting until few days before harvesting. Data were recorded for plant height, panicle internode length, growth cycle, tillers number, spikelet sterility, weight of 1000 grains and yield. Plant height, internode length and tillers number were recorded on 10 to 16 plants according to the IRRI code (Anonymous, 1984), Effective tiller (tillers that bears panicles) number was also recorded per plant or per m^2. No fertilizer or organic matter was applied.

Research Application Performance of varieties is shown in Tables 2, 3, 4 and 5 for respectively Luberizi, Sange, Luvungi and Kiringye.

Table 2. Performance of introduced rice varieties at Luberizi.

Varieties	Height (cm)	Panicle internode length (cm)	Growth cycle (days)	Effective tillers (per m^2)	Spikelet sterility (%)	Weight of 1000 grains (g)	Yield (tons/ha)
SIPI	90.70b	16.97b	140b	441.33c	18.27b	23.97d	5.920c
RW 1	91.69ab	16.93b	105f	375.00d	12.50cd	26.97b	7.360b
RW 5	99.48a	18.93a	126d	410.67cd	10.83d	27.40b	8.150a
RW 9	86.33b	12.87c	121e	462.63b	16.13b	26.97bc	7.970a
RW 13	71.58d	12.63d	104f	509.67b	13.40c	28.07b	7.630ab
RW 17	78.51c	13.60c	104f	570.67a	18.13b	25.64c	8.220a
V 14	80.34bc	12.80cd	132c	428.00c	30.40a	30.32a	7.160b
IRON	92.89a	18.20a	169a	453.00bc	19.57b	25.60c	6.290c

Table 3. Performance of introduced rice varieties at Sange.

Varieties	Height (cm)	Panicle internode length (cm)	Growth cycle (days)	Useful tillers (number)	Yield (tons/ha)
SIPI	80.3a	21.27a	139a	4.75c	1.960c
RW 4	67.5b	12.79d	91b	6.50c	2.850b
RW 8	65.8b	11.65e	91b	6.25c	2.850b
RW 12	59.9c	14.13b	91b	7.75b	2.920b
RW 16	68.9b	13.95c	99b	8.75b	3.480a
RW 20	69.3b	12.18d	99b	7.00b	2.240b
CR 009	68.1b	10.40e	139a	11.75a	2.340b
KAMUTI	84.8a	21.48a	139a	5.50c	1.800c

Table 4. Performance of introduced rice varieties at Luvungi.

Varieties	Height (cm)	Panicle internode length (cm)	Growth cycle (days)	Useful tillers (number)	Spikelet sterility (%)	Weight of 1000 grains (g)	Yield (tons/ha)
SIPI	82.0b	13.1d	153b	335.0b	11.7b	22.50e	1.610d
RW 11	59.0f	12.1d	118d	203.3d	17.1a	22.83e	2.010c
RW 4	73.1d	18.2b	90e	175.0d	16.5ab	27.34b	2.140c
RW 7	79.7c	15.0c	137c	455.0a	7.9bc	25.44c	5.370a
CR 009	67.3e	13.4cd	163a	345.0b	23.1a	24.54d	3.280b
RW 12	87.1a	22.1a	90e	166.6d	12.4b	31.24a	3.420b
RW 3	53.6g	12.3d	118d	270.0c	6.5c	23.97d	2.010c
IRON	77.9c	14.1c	163a	270.0c	3.5c	22.62e	1.670cd

Table 5. Performance of introduced rice varieties at Kiringye.

Varieties	Height (cm)	Panicle internode length (cm)	Growth cycle (days)	Useful tillers (number)	Spikelet sterility (%)	Weight of 1000 grains (g)	Yield (tons/ha)
SIPI	82.61b	26.08a	130c	278.7b	10.88b	24.26d	3.75c
RW 2	78.74b	26.02a	144b	253.0c	14.48a	26.91c	4.77c
RW 6	93.16a	26.30a	100d	174.7d	7.72c	30.19a	5.74b
RW 10	76.57b	25.05ab	132c	292.7a	8.34c	26.79b	6.48b
RW 14	78.28b	23.32b	132c	273.0b	9.24bc	27.54c	5.56b
RW 18	93.80a	26.05a	100d	194.3d	8.43c	29.95a	5.28bc
V 27	90.00a	27.22a	144b	295.0a	9.87b	26.27cd	7.64a
IRON	63.50c	23.94b	175a	244.0c	13.45a	22.93e	2.78c

Results from Luberizi showed that RW 17, RW 5, RW 9, RW 1 and V 14 varieties yielded more (7.16 to 8.2 tons per ha) than local checks (5.92 to 6.29 tons per ha). Interestingly, checks yielded more than in farmer conditions (2 to 2.50 tons per ha) most likely due to farmer use of inappropriate agronomic practices. All the introduced varieties, apart from V 14, can be grown 2 or 3 times a year. They also had low spikelet sterility compared to the checks. According to Schalbroek (2001), varieties in West Africa are usually classified according to the length of the growth cycle into early or short-cycle rice (90 to 120 days, medium-cycle rice (120 to 150 days) and late or long-cycle (more than 150 days). In this study, all the introduced varieties (except V 14) are short-cycle varieties (Table 2).

Apart from RW 13 and RW 17, all the introduced varieties and local checks were more than 80cm tall and may therefore be susceptible to lodging (Schalbroek, 2001). Panicle internode length for all varieties was more than 10 cm (Table 3).

Yields and useful tillers number per plant from Luvungi trial were low, due to irrigation problems. This could be responsible for the variations observed in plant height, growth cycle, effective tiller number and grain yield. This trial will be repeated to confirm the present results.

Results from Kiringye showed that V 27 yielded more than the local checks and other introduced varieties, although its growth cycle was longer than that of all other introduced varieties. It was followed by RW 10, RW 18, RW 6 and RW 14. It also recorded the highest number of useful tillers. A part from RW 2 which recorded the same spikelet sterility with one of local checks, all introduced varieties recorded less spikelet sterility.

This work has shown that RW 17, RW 5, RW 9, RW 13 and V 27, yielding between 7.5 to 8 tons per ha, with low spikelet sterility have potential of being successful varieties in the Ruzizi plains. These varieties are being tested at other sites (Luvungi, Sange and Kiliba) for their suitability.

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