Participatory varietal selection (PVS) to identify upland rice cvs in Ghana

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Abstract

The formal system of cv selection and seed production and distribution has failed to deliver improved upland rice cvs to small-scale farmers in Ghana and no upland cvs have been formally released in Ghana. Over 90% seed used by these farmers is saved from the previous year. A participatory varietal selection (PVS) programme with c. 100 cvs in 1997 and 60 cvs in 1998 was conducted at Hohoe, Volta Region, Ghana. In 1999 seed of farmer-selected cvs (1 kg per cv) was distributed to 95 farmers for on-farm testing. The most popular new cv was IDSA 85 because of its grain shape (i.e. high market price) and adaptability to different hydrological conditions. The number of farmers growing this cv has increased 7-fold over 4 years. Through informal pathways seed is spreading 30 to 100 km per year in Volta Region. Participatory varietal selection is a powerful way for farmers to become involved in the process of selecting and testing new cvs that are adapted to their own needs, systems and environments.

Media summary

Cultivars of upland rice identified through participatory research by farmers are spreading rapidly via informal pathways in Volta Region, Ghana

Key Words

Participatory research, rice, uptake, spread

Introduction

Increasing productivity and production of rice is a major challenge facing the government of Ghana which spends >$100 million annually on rice imports. In Ghana more than 50% of the rice lands can be described as upland and hydromorphic and these are distributed across the country. These are lands mostly used by the most vulnerable in society, i.e. women and the poor. In Ghana very few rice varieties adapted to these ecologies have been formally released. Even where released varieties exist, their seed is neither readily available to the poor farmers nor necessarily the type of cvs farmers or consumers want. Participatory approaches, including Participatory Varietal Selection (PVS: Witcombe *et al*., 1996) and 'mother & baby' trials, offer one way to overcome these constraints by involving farmers directly in the process of variety improvement and testing, as well as by utilising informal seed systems for dissemination. These more informal approached have been adopted by many institutions in both Asia and Africa.

The objective of this study was: (i) to enhance plant breeding efforts by identifying traits and cvs preferred by upland rice farmers; and (ii) to pilot a PVS process in Ghana as a means to improve cv release and seed dissemination to farmers

Methods

Selection of cvs for inclusion in the PVS

At a regional meeting in West Africa rice breeders were asked to nominate cvs and lines for inclusion in a PVS for upland/ hydromorphic rice systems in Ghana. Approximately 95 cvs were nominated and seed

procured. The cvs included a wide range cvs already released in West Africa, as well as NERICAS (*O. sativa ? O. glaberrima* interspecific progenies) and local cvs.

PVS trials in 1997 & 98

Approximately 100 and 60 cvs in 1997 and 1998, respectively, were evaluated by 30 male and 30 female farmers at Hohoe (07?15′N;00?34′E), in Volta Region in eastern Ghana. Trials used an augmented design with farmer and recommended management levels as treatments. The trial site was at the bottom of a toposequence and was a favourable upland site. An improved cv, TGR75 was the check cv. Farmers made selections twice during the growing season and at harvest. Post-harvest assessments were also carried out with farmers and with market traders.

On-farm paired comparisons in 1999

Following the PVS in 1998, seed of farmer-selected cvs was distributed in 1999. Ninety- seven farmers from three communities each received 1 kg of one or two cvs to grow on their own farms under their own management. Approximately 170 kg seed was distributed. Individual farmers were monitored during the season.

Results

Rice system at Hohoe

Hohoe is in the forest zone with an annual rainfall of approximately 1800mm falling between March and October. Upland rice is cultivated on sloping land within a slash-and–burn system. Average farm size is 0.5 ha and the main constraints are weeds and drought. More than half the farmers are women. The local cvs are O. glaberrimas *and 90% farmers use their own seed or seed obtained from relatives. No improved upland cvs are grown.*

PVS trials in 1997 & 98

Farmers identified a wide range of traits as being important for the selection of cvs (Figure 1). In the vegetative phase farmers are looking for weed-competitive traits; at post-flowering it is height, maturity, yield and grain characteristics that are more important.

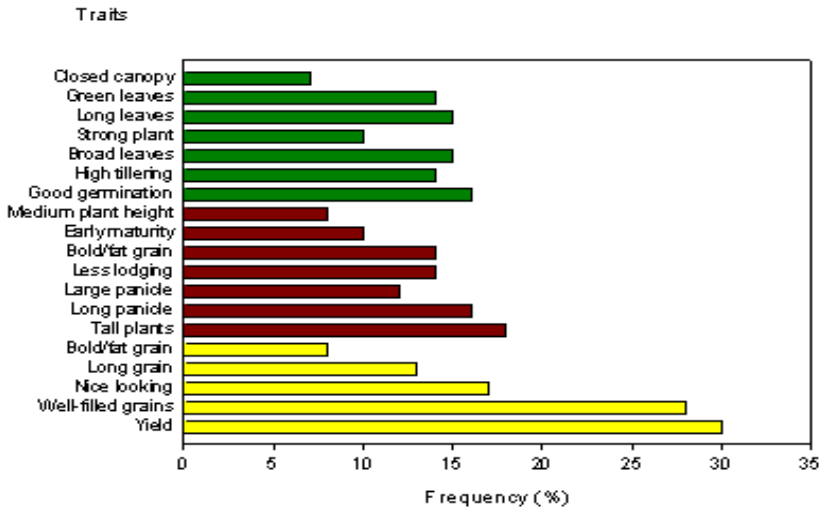

Figure 1. Characteristics of cvs liked by farmers during evaluations at the vegetative (green bars), flowering (brown bars) and maturity (yellow bars) stages of crop development. Frequencies are based on responses of 60 farmers at each stage, Hohoe, 1998

In both 1997 & 98 one cv, IDSA 85, was preferred by more farmers than any other cv (Figure 2). There was little difference in the selections made by men or women, though women usually included a red-seeded cv among their choices as these are used in the preparation of local dishes. WAB 209-5-H-HB, a japonica and some WAB 450 (NERICA) lines were also chosen. The local cv Kawumo had a high frequency of selection because of its weed-competitive traits. All the selected cvs were earlier maturing than Kawumo and higher yielding (Table 1).

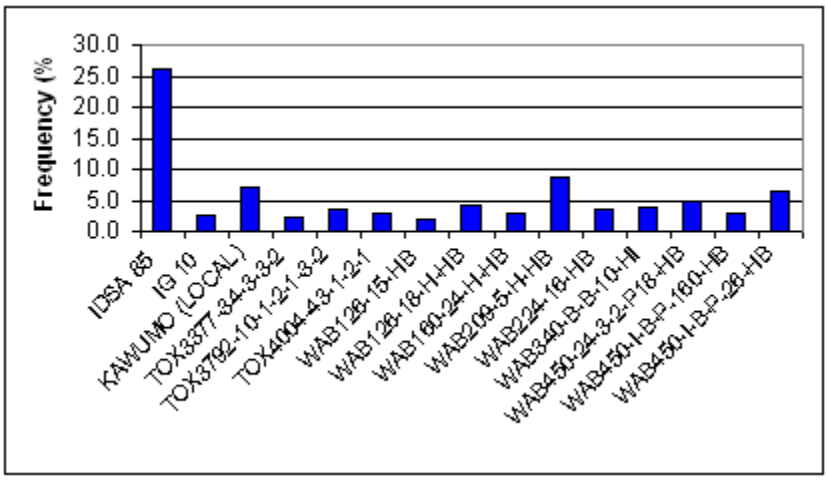

Figure 2. Overall frequency of selection of cvs by 30 male and 30 female farmers at three stages of development. Hohoe, 1998

Table 1. Characteristics of the local cv Kawumo and PVS cvs selected by farmers

Cultivar	Days to flower	Plant height (cm)	No. panicles (m^2)	Grain yield (t/ha)	Ecotype
Kawumo (local)	113	97	152	0.68	Glaberrima
IDSA 85	85	126	160	1.45	IUJ?
WAB209-5-H-HB	93	106	84	1.78	IUJ
WAB450-I-B-P-26-HB	104	85	248	1.63	Interspecific
WAB450-24-3-2-P18-HB	75	108	72	1.20	Interspecific
WAB126-18-H-HB	93	101	106	1.23	IUJ
WAB340-B-B-10-HI	79	123	158	1.51	IUJ

? IUJ= Improved upland japonica

Although a very large number of cvs were used initially, farmers did not appear to have any problems evaluating so many cvs. However, a more targeted approach using a cv needs assessment prior to the PVS to choose a fewer cvs (c. 10) has worked well in other areas of Ghana (Dogbe *et al.*, 2003).

On-farm paired comparisons

In 1999 farmers grew 100m^2 plots of selected PVS cvs alongside their local cv for further evaluation. Earlier maturity was the most important trait pre-harvest. Post-harvest, superior yield and taste were the main reasons cited for selecting PVS cvs over the local cv (Figure 3).

Overall, grain type (which encompasses presumed quality and/or higher market price) and yield were the dominant selection criteria. One post-harvest trait which is important to farmers not evaluated in the PVS process is storability. Locals cvs store extremely well and keep their viability whereas some improved cvs are reported by farmers to store poorly.

IDSA 85 remained the most popular cv with farmers, who rated this cv better than local and other PVS cvs.

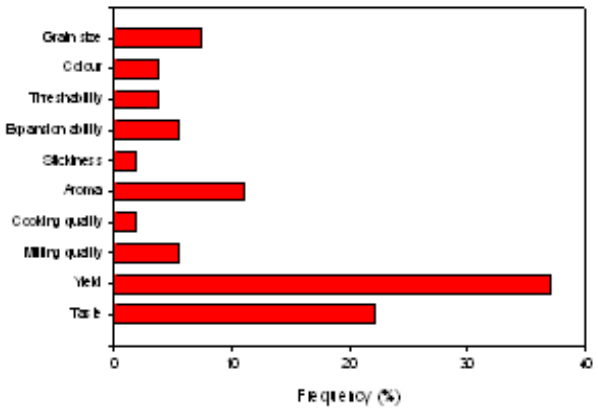

Figure 3. Post-harvest traits listed by farmers as important selection criteria and the frequency of selection of these traits when comparing PVS with local cvs

Seed spread

Farmers named IDSA 85 'Idana', meaning 'you'll not be tired' because of it's ease of threshing. This cv is spreading rapidly – about 30 to 100 km per year, through informal seed systems (Dogbe *et al.*, 2003). The area under this cv has increased about 7-fold in four years, and all from an initial distribution of about 70 kg. There was also a severe drought in 2000 (July to December rainfall 617 mm) and 2001 (429 mm) compared with 955 mm in 1999. In one of the villages given seed in 1999, >90% farmers are now growing a PVS cv. Initially, most seed spread through family, relations and friends, often through swapping or in return for seed being repaid at the end of the season. Some communities also set up seed banks to promote distribution within the community. Within three years seed producers had also started producing and selling much larger quantities of seed. Seed of new cvs also sold at a premium, about 30% above the market price for local cvs.

Conclusion

PVS has successfully identified the traits and type of cvs preferred by farmers. In particular, breeders must assess post-harvest traits and market value prior to release, and take account of local preferences. Post-harvest assessments also need to be included in the PVS process as early as possible. IDSA 85, the most preferred cv from the PVS process, was first tested in Ghana many years ago, but never by

farmers and never released. Good cvs will spread rapidly through the informal seed system, especially once excess seed starts to become available. To scale this process up, seed producers in neighbouring and distant villages need to be identified and supplied with seed and some information about the cvs. Institutionally, these participatory approaches can be used either in parallel or as a substitute to formal testing and release procedures, serving to identify cvs likely to be adopted by farmers as well as putting seed into the informal sector.

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