Farmer participatory varietal selection in Lao lowland rice systems

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Abstract

Participatory variety selection (PVS) is being used by the ACIAR funded UQ-Lowland Laos Project to improve rice varietal adaptation and seed production. The strength of this participatory approach is in allowing farmers' judgment on grain quality and plant type to enter the breeding process in the final stages, ensuring local adaptation and fostering ownership of the chosen varieties which encourages seed production and distribution. Eating quality especially is an important parameter – probably even more important in Lao PDR – that has caused otherwise suitable varieties to be discarded by farmers. In the absence a of a well-resourced grain quality program to assess early generations, it is a pragmatic middle way.

The two provinces that returned data differed in varietal preference. Vientiane Province selected solely TDK varieties, which were bred in Vientiane Province (TDK9, TDK11, TDK 25 and TDK42). Champassak Province, in southern Lao PDR, selected varieties from a range of sources (TDK8, PNG3, TDK49, TDK1 and TSN7). The methodology in the 2007 wet season was deficient in four ways: eating quality was not assessed (insufficient grain), selection was done solely on plant type and not with yield data, very few women were invited to select in Vientiane Province and the PVS was not conducted in a drought-prone environment. All of these will be addressed in wet season 2008. This will be an ongoing process; as such the ability of farmers, local staff and national staff to conduct and utilize PVS has been improved.

Key words

participatory variety selection, rice, Lao PDR

Introduction

Lowland rice farmers in the Lao PDR initially quickly adopted improved varieties and recorded significant yield gains, but the adoption rate of recent releases has been slower. The ACIAR funded UQ-Lowland Laos Project (ACIAR CIM-2006-041) is using participatory variety selection (PVS) to make the Lao rice breeding program more 'client-oriented' (Witcombe *et al.* 2005; Joshi *et al.* 2007). Chosen farmers are invited to choose from advanced local improved lines, aiming to achieve better local adaptation, reduced cost and increased varietal adoption in the project areas.

PVS in rice has been used in many locations in recent years, usually complementing both CGIAR and national breeding programs (Morris and Bellon 2004). Drought adaptation has been a common character targeted with PVS. A PVS program, focused on achieving better drought adaptation, was established in 2000 in neighbouring northern and northeast Thailand (Jongdee *et al.* 2006). Likewise, drought adaptation has been a feature of PVS in the Indian subcontinent (Virk *et al.* 2003).

Witcombe *et al.* (2005) warn that many 'mother-baby' trials are simply demonstrations, by not allowing farmers to select from a adequate range of adapted germplasm, although Courtois *et al.* (2001) conversely warn of including too many poorly adapted lines, which will artificially inflate consensus between farmers and breeders. Both Jongdee et al. (2006) and Courtois et al. (2001) highlight the need to stratify farmer selection by target population of environments (TPE), if a range of TPEs can be identified. Likewise PVS with grain quality evaluation should stratify to include both males and females, due to different preferences and trade-offs (Dorward *et al*. 2007).

Materials & methods

Experiments were conducted at three research stations: Pak Cheng Station in Vientiane Province, Thasano Research and Seed Multiplication Center in Savannakhet Province and PhonNgam Research Station in Champassak Province.

Twenty varieties were tested at each location, with 19 of them common including one standard check (TDK1) at all locations. The remaining one was specific to each Province. There were 3 replicates, with each plot 1.0 m x 5.0 m. Seeds were sown in mid-June and transplanted in mid-July. A basal application of fertiliser (30 kgN, 30 kgP_2O_5 and 30 kgK_2O kg/ha) was applied at transplanting. Urea (15 kgN/ha) was applied at approximately 2 weeks and 4.5 weeks after transplanting. Plots were weeded twice.

At each location, sowing date, transplanting date, flowering date, plant height and grain yield/plot (3 rows x 4m) were determined.

Sixteen farmers in Vientiane, 8 farmers in Savannakhet and 17 farmers in Champassak participated in the mother trial 2007WS, but results from Savannakhet are not available. The farmers in Champassak were an equal mix of men and women, but were not in Vientiane.Two weeks before harvest, farmers from the target districts were invited to select the best varieties and scored their preferences, according to plant type, panicle type and number per hill and earliness. They had no access to yield data at the time. The farmers each selected 3 varieties of their preference and seed will be provided for their use in the 2008 'baby' trials. They are then free to distribute subsequent seed to their colleagues. Because of the small amount of grain harvested from the experiment, cooking quality was not evaluated. This will be done in 2008.

Results

Grain yield and other characters are listed in Table 1. The (visually selected) preferred varieties were not necessary the highest yielding. No gender-differentiated data was available.

In Vientiane Province, participating farmers preferred TDK9, TDK11, TDK 25 line and TDK42 line, all varieties/advanced lines developed in Vientiane Province, which also tended to be large-panicle varieties. In Champassak, they preferred TDK8, PNG3, TDK49 line, TDK1 and TSN7, sourced from three different breeding programs (Vientiane, Savannakhet and Champassak). There were no common varieties selected by the two groups of farmers. Earliness did not appear to be an important selection criterion for the selected farmers.

Table 1. Grain yield, days to flower (FL) and panicle density of the varieties and advanced lines in the PVS at Vientiane (VTN) and Champassak (CPK). The chosen varieties are in bold, italic font.

No	Variety name	Vientiane	CPK	Vientiane	CPK	Vientiane	CPK
?	?	GY(kg/ha)	GY(kg/ha)	Days FL	Days FL	Panicle/hill	Panicle/hill
1	TDK8	4992	***3755***	98	***108***	8	***6.3***
2	TDK9	***4414***	3302	***96***	107	***8***	6.7
3	TDK11	***4450***	3417	***96***	102	***10***	6.7

4	TDK25	***3987***	3878	***105***	115	***9***	7
5	TDK42	***3843***	3653	***105***	115	***7***	6.3
6	TDK49	4933	***3929***	98	***106***	8	***6.7***
7	V17	3985	3450	104	113	7	7
8	PNG5	4291	3979	105	111	10	7
9	PNG6	4725	3404	96	111	9	6.3
10	TDK6	4503	3993	106	114	9	7
11	TSN2	3978	3629	105	109	9	8.3
12	TSN3	3420	3859	107	113	8	8.3
13	TSN4	4098	3764	104	112	11	7.3
14	TSN5	4104	3069	99	101	10	6.3
15	TSN6	4355	3677	98	101	10	5.7
16	TSN7	4433	***3445***	101	***108***	9	***7.7***
17	TSN8	4489	3300	105	110	9	6.3
18	TDK10159	4388	3230	101	110	9	7.3
19	TDK1	4663	***3829***	106	***113***	13	***7.7***
20	NTN1(VTN)	5098	?	98	?	12	?
20	PNG3(CPK)	?	3290	?	110	?	7
Pr>F			0.046				0.031

CV (%)	9.7	12
LSD (5%)	579	1.38

Discussion

Our PVS methodology is in allowing farmers' judgment on both objective and subjective parameters to enter the breeding process in the final stages. This can make the breeding process more efficient, by testing in TPEs earlier, delivering better-adapted varieties faster, speeding seed distribution of preferred varieties by informal distribution networks and also feeding back farmer preferences earlier to the national breeding program (Virk *et al.* 2003; Belay *et al.* 2005; Dorward *et al.* 2007). Eating quality especially (once included in our PVS) is an important parameter that has caused otherwise suitable varieties to be discarded by farmers. In the absence a of a well-resourced grain quality program to assess early generations, farmer eating quality assessment is a pragmatic middle way that does not require much seed or other resources (Atlin and Witcombe 2002).

The weaknesses of our approach to date, are a need for a sufficient flow of well-adapted, local advanced lines (from a resource-poor national breeding program) to supply the process (Morris and Bellon 2004), insufficient attention to selecting farmers to cover all TPEs (Gyawali et al. 2007), an inadequate screen for drought at each location and insufficient consideration of gender in farmer selection (Dorward *et al.* 2007) in Vientiane Province. This was preliminary attempt to introduce farmer practice in Laos, and there are a number of lessons we learned. One interesting observation was that the farmers in Vientiane Province did not prefer any varieties developed in other provinces. We are investigating whetherer there is any variety characteristics that induced this.

Eating quality was not assessed in the work, as there was insufficient grain available for this purpose. Inclusion of grain yield and quality data would modify the ranking, although the relative weighting of each parameter needs to be determined. We will conduct another cycle of this mother trial at more appropriate locations, particularly shifting focus to drought-prone environment with farmers who are more experienced with drought. We will keep some (those selected by the farmers) of the original 20 varieties/advanced lines to select from, but will also include new advanced lines from the Lao program and drought-screened varieties from the Thailand PVS program.

The 'baby' trials will proceed as planned in the three locations that successfully completed the 2007 PVS program. Farmers will compare performance of their (2007 wet season) selected varieties with their usual varieties. The results of the dry season PVS will be compared to these results, to assess if preferences are different between the seasons. Despite some deficiencies, the 2007 PVS was a helpful introduction to the Lao breeding programs and did build capacity amongst the selected farmers, district staff and Lao breeders. PVS needs to be an ongoing process (Dorward *et al.* 2007). This project begins that process.

Conclusion

Participatory variety selection found different varietal preferences in the two provinces where results were obtained. Vientiane Province selected only TDK varieties, whilst Champassak selected varieties from different sources. A range of methodology changes will be introduced in the 2008 wet season - particularly assessing eating quality, making selections with the use of yield data, ensuring women are better represented and selected at more drought-prone sites - to make the PVS align better with the local target production environment.

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