



E-ISSN: 2278-4136

P-ISSN: 2349-8234

JPP 2018; 7(6): 1248-1250

Received: 07-09-2018

Accepted: 09-10-2018

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## Farmer participatory approach to utilize landraces and local cultivars for germplasm conservation

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**Abstract**

The attitude toward landraces has been changing in recent years, as improved cultivars have not always proved to be superior, for example in marginal environments or under specific socioeconomic conditions (Ceccarelli *et al.* 1992). Landraces are sometimes also preferred by farmers for quality aspects (Dhamotharan *et al.* 1997). Thus, a new interest has arisen to use traditional landraces as such, or in breeding programmes for further enhancement.

Our objective was not only to document the farmers' knowledge together with each sample, but also to actively involve the farmers in the identification of landraces and representative samples to be collected. Involving farmers in the collecting of germplasm could avoid unnecessary cost of evaluation, because some of the information required might already be known among the present users. In this approach we propose that farmers' knowledge could help to identify samples that are most representative of a landrace, and also to classify and use landrace collections more efficiently.

So our ultimate objective is to enhance diversity, quality and productivity of farmers by using various genetic resources of different crops.

**Keywords:** Landraces, local cultivars, germplasm conservation and germplasm explorations

**Introduction**

Prior to collecting, specific districts will be finalized as target areas, covering the east-west dimension of the country and a wide range of socioeconomic as well as natural conditions.

The collection will be carried out in three stages:

**First step:** The purpose of the first stage was to identify areas or villages in a district where landrace cultivars are still regularly grown. We will gather initial information from local farmers and stake holders working in the field. We will talk directly with farmers about where traditional landraces is still being grown and used, and why. In such places, we identified 2 or 3 families having the most representative material and being experts in knowledge about that particular germplasm in the opinion of the villagers. These farmers will be informed about the purpose of our study and that we would like to visit them again at different stages to collect the samples. The farmers will be also asked to give a general description of their landrace, and whether it is different from other local cultivars grown in surrounding villages or other nearby places. Occasionally, only a single family in a village may be involved in maintaining a landrace. In these cases, most often it had been brought from other places, and samples will be then collected from the place of origin also.

In cross-pollinating crops, it is not always easy to identify landraces without introgression of exotic material in areas where both landraces and modern varieties are grown. Therefore, it will be part of our methodology to ask questions of elder villagers about the history of a landrace in the village and with a farmer family, about seed management during drought periods, and about differences between present-day landraces and the landraces they had known during their youth. This information will be needed to separate more or less "pure" or original landraces from material where a lot of introversion had taken place in recent years.

**Second step:** From each identified variety and farmer, we will collect 20 to 40 sample of randomly from their fields. This sampling strategy will be applied because of the specific requirements of a diversity study, for which the samples were needed, and may not be adequate for other purposes, such as conservation of landraces. The information on seed-management practices, description of the landrace, environment and agricultural practices, as well as specific adaptation, uses and reasons for the family to grow this variety will be

recorded. Names of the donor(s) as well as people who participated in the interviews were documented for each sample.

**Third step:** In a third step we will revisit villages and farmers of specific interest during the post-harvest time. At this time we could collect detailed information about seed and quality aspects and specific seed-management procedures followed by the villagers. These are areas of expertise in s of Rajasthan, and do require specific attention.

Step one will be completed by travelling in all concerned districts, 2-5 weeks before harvest. Step two and the collecting of samples will be taken place in these districts, in 20 days of travelling. However, as per the commencement of the harvesting in some areas, steps one and two may be required to merge together in some cases. In total, a lot of farmers will be interviewed at roadsides, village tea-shops, in their fields and at their homes. The third-step visits will be restricted to only selected villages/regions of specific interest, and 2-4 days were spent in each of them.

### Composition of collecting team

In a gender-sensitive social environment such as of rural areas, the composition of a germplasm collecting team is also an important part of the methodology. Our team will be consisted of female as well as male scientists of different specialization i.e Pl. Breeder/ extensionist/ pathologist/ agronomist/ soil expert/economist and translator of the local language and a male driver/assistant. Most of the places were visited in the post-harvest period (third step) with female-members/co-workers of the team to encourage women farmers to express their knowledge, which is more difficult in the presence of men.

### Communication tools

Participatory communication tools will be used with farmers as per the standard criteria suggested by Dhamotharan *et al.* 1997 [2]. Based on this experience, we will decide to use semi-structured interviews in discussions with groups and individual farmers. This interview technique leaves the conversation open, but some pre-defined questions will always be asked sooner or later during the interview. Nevertheless, unexpected topics raised by the farmers themselves can also be discussed, and the questions can purposely be asked in a way to encourage new and unexpected points (Schönhuth and Kievelitz 1994, p. 77-79) [3].

An important element of PRA methods is visual sharing of the matters discussed. Therefore, farmers will be encouraged to show the crop in the field or describe traits using grain samples or whole panicles, whenever possible. Additionally, tools like pairwise ranking or mapping will sometimes be used to describe differences between varieties, soil conditions, agronomic or seed-management practices in greater detail as per the standard guideline adopted by Schönhuth and Kievelitz 1994 [3].

### Documentation

The interviews will be documented by one team member taking notes during the interview. Soon after each interview, we will fill in details and clarified the notes. In some cases, the documentation will be done with tape recorders, and the interviews will be transcribed and translated later. The collecting team will add information such as latitude and longitude of the collecting site, topography, agronomic score, frequency and their own observations. The data will be

transferred into a specifically designed form after collecting, so that the conversation with the farmers will not dominated by the form-filling procedure. The samples will be stored for further analysis, and a second set of samples will be sent to the National Bureau for Plant Genetic Resources, New Delhi, along with the collecting report as per guideline suggested by Christinck *et al.* 1998 [4].

### Advantages with PRA techniques during collecting trips

Semi-structured interviews and PRA tools can be successfully applied for communication with farmers, even when the collecting team is visiting the village for the first time. The research team going to traditional meeting places, farmers' houses, and fields, and initiating the conversation with open questions may allow the villagers to express their knowledge. Farmers themselves very often may suggest visual sharing like looking at samples or fields, so that PRA elements such as pair wise ranking could easily be integrated into the conversation. This, however, depends on the season and availability of whole plants or panicles during the interview time.

There is a tendency toward large gatherings of the villagers during the first stage of the collecting process, with the possibility that lower-status persons could not speak freely. This would be avoided by also talking to people in their fields or houses. In this context, it would be clearly an advantage to visit the same villages and families twice. The working atmosphere shall be more relaxed during the subsequent visits, and thus the quality of the information may considerably better. This will particularly apparent in those cases when the follow-up visits will be conducted during the post-harvest season. During this time, farmers as well as researchers are not pressed by pending harvest operations. Having more time in a village also opens up the possibility to meet people from more different castes and groups in the village, and more women, which is particularly important if gender-specific knowledge has to be documented. In Rajasthan, women are key persons involved in activities such as seed selection and storage, preparation of food and medicines, and feeding animals, but do usually not participate in a conversation in the presence of (male) villagers. The follow-up visits may allow researchers to explain in more depth the possible implications for participants, answer farmers' questions, and develop a relationship of personal trust.

As per the required considerations, it will be better to test and adapt communication methods based on PRA approaches for their use during collecting trips. We can include pearl millet in case of cereals, Sesame in oilseeds or widely used legumes like mungbean, gram etc. among pulse crops. The samples will be required for a diversified study in the framework of this important project to enhancing quality, diversity and productivity of farmers by using various genetic resources, which will be analysed and emphasized jointly by the Agriculture Universities as well as State Agriculture Developments.

### Outcomes

Germplasm will be collected and exchanged. Initially, explorations will be aimed to find appropriate species and local "varieties", indigenous genetic resources (landraces) commenced to be regarded as a "raw material" for crop improvement, containing useful traits which have to be combined or improved by plant breeders.

Germplasm explorations will be undertaken by scientists, with the intention of collecting the widest possible range of genetic diversity of a crop or wild species, based on geographical distribution, observation of morphological traits, agroclimatic data, soil conditions and population genetic considerations as per the authenticated guideline (Marshall and Brown 1975<sup>[5]</sup>; Witcombe and Gilani 1979)<sup>[6]</sup>.

Newly collected material will then systematically characterized on our research stations based on criteria considered to be important by taxonomists and plant breeders, so that information about the new collections can be made available to potential users.

The information obtained from farmers is not comparative for all samples obtained, but only for those varieties which a specific farmer knows. This knowledge is based on long-term observations under the range of growing conditions encountered on his farm and village. This knowledge could guide other potential users who work under comparable growing conditions, as well as researchers who are searching for a specific type of adaptation in a larger collection. This would, for instance, allow researchers to test only a subset of the collection with an increased chance to find specific traits, and with a smaller number of entries in the trials.

Population geneticists recommend that the aim of exploration for conservation of genetic resources should be to maximize the possibility of collecting alleles which are locally common and thus may represent important adaptation to the local environmental conditions. This strategy would require information about the population genetic structure of the target species, which is most often, and especially in the case of quantitative genetic traits, not available to the researcher. Therefore, the collectors should visit as many diverse collecting sites as possible within a range of environments, and consequently spend a minimum of time at each site (Marshall 1990)<sup>[7]</sup>.

With the participation of farmers, only key samples that farmers themselves value highly as being representative of a particular landrace and thus may represent a high specific adaptation, will be collected. This strategy would save both time and resources, and could keep the numbers of new samples down to a justifiable minimum. In some cases, it could also be considered how the farmer from where the original sample was collected could be involved in rejuvenation and multiplication of the sample, or further evaluation, if required.

Sampling landrace germplasm appropriately within a region without involving the farmers appears difficult. While natural selection certainly has a big influence in shaping the composition of landrace populations, the contribution of farmers' seed-management practices seems to be underestimated.

Interviews may reveal that farmers in tend to maintain specific landraces with well-known characteristics and different villages pursue different strategies. However, farmers aim at increasing variability within their seed stocks, and keenly integrate new acquisitions of germplasm into their individual seed stocks (Dhamotharan *et al.* 1997<sup>[2]</sup>; Weltzien *et al.* 1998)<sup>[8]</sup>. Farmers' seed-management activities such as selection, processing and exchange do contribute significantly to the composition and the distribution of genetic variability between and within populations. Future research on the collection itself will investigate the distribution of DNA-marker variability, to substantiate these observations at the molecular level.

## Conclusion

The outcome of this study will serve as a guide to the farmers when planning for their vegetable production and protection strategies. Also this approach of germplasm conservation will be very helpful in crop improvement, having valuable data information, which have to be integrated and evolved by plant breeders.

## Acknowledgement

The authors are grateful to Dr. D.K. Garg, Professor (PBG), SKRAU, Bikaner for his valuable guidance and needful help for initiating the investigation.

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