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Anja Christinck: “”This seed is like ourselves” - A case study from Rajasthan, India, on the social aspects of biodiversity and farmers' management of pearl millet seed”, Universität Hohenheim, 2001

Summary

Introduction and background

Rajasthan is a semi-arid state in north-west India. Western Rajasthan includes parts of the Thar desert and is characterized by marginal farming conditions with sandy soils and highly erratic rainfall, ranging from <250 to 350 mm annually. In the eastern part of the state, the conditions are more favorable, with annual rainfalls ranging from 400 to >650 mm, more fertile soils and greater irrigation facilities. Pearl millet (*Pennisetum glaucum* [L] R.Br.) is the staple food of the people as well as an important source of animal fodder. It is grown on four to six million hectares annually (representing about 20% of the world's production area of this crop).

Although the development of pearl millet varieties with high yield potential has been pursued by both private and public research institutions for more than 30 years, the "adoption" of this seed has so far been limited in Rajasthan. On-station experiments suggest that these varieties have no yield advantage over traditional landraces under marginal conditions, and pearl millet yields in Rajasthan have not increased over the last three decades in dry-land agriculture (SENGH, 1997).

However, in Rajasthan (as elsewhere in the world), an on-going process of change regarding farmers' use of varieties can be observed. Traditional landraces have been replaced by modern varieties, or farmers prepare mixtures of varieties and select among the progeny. Those strategies may have far-reaching effects on yield and quality of farmers' pearl millet seed. Due to the cross-pollinating nature of pearl millet, practices of some farmers could also influence the genetic composition of a village's seed stock as a whole. In Rajasthan, the traditional caste system divides the villagers into various social groups with differing access to resources, including for example land, cash money, irrigation facilities, or information. Varietal change could thus have quite different effects on people belonging to distinct social groups.

Focus of research

The study was initiated as part of a project designed to investigate quality, diversity and productivity of farmers' pearl millet genetic resources in Rajasthan. The project focussed on the farmers' needs and preferences, as well as on developing new strategies of plant breeding

and genetic resources conservation with the active involvement of farmers. One special feature of the project was that an agricultural social scientist (A. Christinck) and a population geneticist (K. vom Brocke) worked closely together. The project was jointly implemented by ICRISAT along with its national partner institutions in Rajasthan, and the University of Hohenheim. Local NGOs and farmers were involved in an informal capacity. The project was funded by the German Ministry for Economic Co-operation and Development (BMZ) with administrative support from the German Society for Technical Co-operation (GTZ).

Aim of the project

The main objective of the thesis presented here was to describe farmers' own methods of maintaining and improving their pearl millet seed. Furthermore, the reasons for applying these methods and the underlying concepts of the farmers were assessed, as were the differences between the geographical regions and social groups. Special emphasis was given to seed management strategies, including the use of different varieties, selection, storage, processing, exchange and procurement.

Additional objectives, that went beyond a pure documentation of farmers' practices, were:

- To understand why farmers apply certain methods of seed management and to explore the socio-economic, cultural and/or ecological contexts in which they are applied.
- To develop further participatory research methods for topics related to the conservation of agro-biodiversity, seed systems and plant breeding.

Methodological approach

The development of the methodological approach for this study was based on the theoretical assumption that different knowledge systems exist which can contribute jointly to the exploration of a research topic. For this purpose, qualitative methods of social science, in particular those which have been described as Participatory Rural Appraisal (PRA) methods, were combined in order to design an individual and situation-specific research approach. The particular advantage of a participatory approach is that the views and needs of the participating farmers represent the focal point of all the research activities (SCHONHUTH & KIEVELITZ, 1994).

The study area included nine districts of Rajasthan, essentially covering the entire range of rainfall and soil conditions. In the first phase of the field work, we initiated spontaneous group interviews with farmers on their use of varieties, farming and seed management practices. For the subsequent phases of the fieldwork, the villages or regions were then carefully selected in order to efficiently explore our research topics. Individual farmers or families were visited at their homes or in their fields. We intentionally sought after people from different castes, with different access to resources, and made a particular effort to encourage the active participation of women farmers. The village-level studies were completed by on-station workshops, in the course of which farmers classified and evaluated potential breeding populations.

The main methods used were semi-structured interviews, visualization, direct observation of

farmers' practices, and other PRA tools such as classification and ranking exercises (MUKHERJEE, 1993; SCHONHUTH & KJEVELITZ, 1994). A semi-structured interview implies that the course of a conversation is left open, however some pre-defined key questions or topics will always eventually be raised.

All interviews were translated from Hindi or a local Rajasthani dialect into English, and most interviews were recorded on tape. In some cases notes were taken to either supplement the tape recording or instead of it. Other forms of documentation were plant samples, photographs and maps or drawings made by the participants. From this material, interview protocols were then transcribed in English and processed by marking the most pertinent statements with codes such as colors or figures in order to assign them to the relevant research topics. This method of evaluation of qualitative data has been described by HOPF & WEINGARTEN (1993).

As statistical data analysis was not applicable, alternative procedures to check the reliability of the data obtained by the PRA methods were applied. These operations are known as sequencing and triangulation, and imply effective combinations of PRA tools in a step-wise procedure, and "cross-checking" by varying for example the team composition, the sources of information or the communication tools (SCHONHUTH & KJEVELITZ, 1994).

Results and conclusions

The results of this study are subdivided into four main areas: The farmers' concept of a variety (1) and their understanding of food and fodder quality (2) were investigated in order to explore a basis for understanding the farmers' use of varieties and their selection criteria. The documentation of the farmers' seed management practices (3) was the major focus of the study, which was completed by a description of traditional seed markets (4).

Farmers' concept of a variety

Farmers in Rajasthan subdivide all pearl millet varieties into two main categories, desi and sankur, which represent contrasting and complementary plant types. The desi type is a plant with thin stems, narrow leaves, high tillering ability and thin, compact panicles with small, hard grains, mostly yellowish in color. This plant type corresponds to the traditional pearl millet landraces, whereas sankur represents a plant type more common to modern varieties. It has only one or, at most, a few productive tillers, thick stems, broad leaves, large and less compact panicles with larger grains which are either gray or white in color.

Farmers used botanical traits for their classification of pearl millet varieties, but these were not of any "academic" interest as such. Instead, farmers closely related morphological plant traits to environmental adaptation, and also to the yield and quality of the grain and stover produced. According to the farmers' concept, pearl millet plant types are not generally stable. They are understood as being a product of the environmental factors, under the influence of which the plant population developed. If seed is brought to another location, intermediate plant types will occur. Consequently, it is not surprising that farmers generally name pearl millet varieties

after the place of origin of that variety. In the case of modern varieties, more farmers can recall the location where the seed was produced than the actual name of the variety they are growing (TR.IPP & PAL, 1998, 2000). The farmers' concept of a variety is thus different from that commonly used by plant breeders, according to which a variety is a stable and homogenous plant population, which can be clearly distinguished from other varieties.

These findings have consequences if one thinks of designing strategies to link on-farm and ex situ conservation strategies, or also for participatory breeding programs.

The farmers' concepts of food and fodder quality

In the opinion of the farmers in Rajasthan, the important quality aspects of pearl millet include its culinary, nutritional and medicinal value as well as its storability and ease of processing. Furthermore, similar qualities are also considered important with regard to animal fodder prepared from grain or harvest residues of the crop. Altogether, 18 aspects of food and fodder quality were found to be important, according to our interview partners.

The farmers' concept of quality is thus comprehensive and related to their general situation of life in various respects. For example, the storage quality of prepared flat breads is important as food cannot always be freshly prepared, given the situation that fuel for cooking is scarce, women have many other duties to perform and some family members may not return home for many hours or even days while herding animals. SOLERI & CLEVELAND (1993) remarked that crop varieties are not only adapted to biophysical environments, but also to specific socio-cultural conditions. The pearl millet landraces of Rajasthan seem to be well adapted to the overall situation and manifold needs of the rural people, while modern varieties seem to be quite deficient in this respect: Regarding all the quality-related criteria mentioned by the farmers, modern varieties of pearl millet were not found to be superior to the traditional landraces in a single one.

It is one of the most striking results of this study that people living in the marginal areas of western Rajasthan, where other food is not easily available, put most emphasis on quality. Also, the storability of grain and straw, which is described as an advantage of traditional local varieties, was of particular importance to people living in drought-prone areas, where generally the harvest of good seasons is stored for several years for consumption in famine years. However, in the official process of variety testing and release, quality assessment is only occasionally performed. A greater emphasis is placed on yield, and restrictive standards exist regarding disease resistance. This concept appears to be too narrow to meet the needs of farmers, and particularly of poor farmers living in marginal areas of Rajasthan.

Farmers' seed management

The term "farmers' seed management", as it was used in this study, includes all actions taken by the farmers that may affect the genetic composition as well as the viability of the seed. Farmers themselves often put much emphasis on general cultivation practices, such as soil preparation, application of manure, sowing density etc. Such practices were assessed in the earlier phase of the field work, as was the division of labor and responsibilities within families. It was found that in Rajasthan, women, and particularly the older women of a household,

traditionally had control over the family's seed stock. Most often, women select the seed, clean and store it, and prepare the seed mixtures, which may contain seed of different pearl millet varieties plus seed of other species, such as legumes, sesame and cucurbits.

The farmers' use of varieties differed greatly between the geographical regions Rajasthan. In western Rajasthan, modern varieties are only sown as such in irrigated fields, but it is a common practice to mix small amounts of modern variety seed into the farmers' own seed stock. As pearl millet is a cross-pollinating crop, this practice leads to very diverse populations, and to a slow, gradual process of variety replacement. Farmers living in marginal areas with sandy soils and low annual rainfall generally rely on traditional landrace varieties, which are considered to be best adapted to drought stress conditions. In eastern Rajasthan, many farmers grow modern varieties, sometimes in addition to landraces, which are grown in separate fields due to their longer duration. Poor farmers often used advanced generations of hybrid seed, as they cannot afford to buy new seed every year. Forty to fifty percent of the farmer participants selected panicles showing preferred traits, and some participants purposely selected for various contrasting plant types, while other farmers used grading methods to separate bolder grain for seed purpose. The farmers observe that selected seed grain matures earlier and increases yield in low rainfall years, a tendency which was confirmed by field trial observations (VOM BROCKE et al., 2002a).

A further way in which farmers influence the composition of their seed stocks is by exchanging seed. This can be a regular measure with the aim of increasing productivity. On the other hand, farmers may be interested in obtaining seed of a preferred quality, or poor farmers may procure seed from other farmers or relatives whenever their own seed is lost or consumed. This type of interaction has a strong social dimension, and generally implies a gain of status for the person who shares seed with others.

To summarize, it appears that the manner in which farmers in Rajasthan manage pearl millet seed is a flexible response to the challenges posed by the prevailing socio-economic and environmental conditions. Against this background, the idea that plant breeders should develop "improved" varieties which should then replace farmers' own seed resources appears too simplistic and reductionist. Thus, it would be better to recognize that supporting the farmers' own crop improvement strategies, for example by providing adequate information and breeding material, could offer greater promise than approaches that aim at replacing the traditional seed management system.

Traditional seed markets

As described above, traditional seed markets, where seed is being shared, borrowed or exchanged, exist in every village. Additionally, various "famous" seed villages were identified, that are considered to be the places of origin for pearl millet landraces of outstanding quality, and where farmers from far off come to purchase seed. Regarding the area where seed from such "famous villages" is sown, they are as important for seed distribution as the formal sector of the seed market, with a total market share of between 20 to 25%. Traditional seed markets show many large differences when compared to the formal system of seed distribution. Traditionally, seed is given from farmer to farmer without the involvement of intermediate traders. This system ensures a high degree of transparency with regard to the origin, environmental conditions, cultivation practices and quality. The seed from traditional sources is also much less expensive than seed of modern varieties. In western Rajasthan, the traditional

seed market is the most important source of seed in drought periods, and it is of outstanding importance particularly for poorer families within a village community. However, mainly the wealthier farmers with better land resources, who have traditionally provided others with seed, profit from the use of modern varieties. In some areas, traditional landrace seed is scarcely available. This indicates that the traditional system for seed distribution has been weakened, in the way that it fails to provide poor farmers working on marginal land with the seed that is best adapted to their conditions. The active participation of this group of farmers should be ensured if one thinks of promoting in situ conservation of pearl millet landraces in Rajasthan.

The farmers' own crop improvement strategies and the traditional seed system could point the way to future co-operation with research and development institutions. The farmers' profound knowledge on environmental adaptation of pearl millet plant types, the consideration of quality aspects and socially adapted seed distribution systems could contribute essentially to improving seed and food security for rural people of Rajasthan.

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