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The joint development of JM-12.7: A technographic description of the making of a bean variety

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ABSTRACT

Participatory Plant Breeding (PPB) is one of the areas of Participatory Technology Development (PTD) in which collaboration of researchers and farmers has been reported as quite successful although its institutionalization remains problematic. This paper aims to contribute to better understanding of PPB processes. It focuses on the practices of developing a common bean variety (*Phaseolus vulgaris* L.) by a group consisting of a breeder, farmers and NGO technician in northern Nicaragua. The description is an example of a technography and uses the concept of boundary object to analyse how actors come together around a shared goal and how their knowledge and practices are combined in the material making of five varieties, eventually leading to JM-12.7 as a formally released variety. The material making of five bean varieties is central in the first part of the process and shows how in practice different knowledges within the group interact. The second part of the process leads to distinguishing socio-political boundaries. The formal registration of JM-12.7 required crossing of these boundaries and prompted the reorganization of the group into a co-operative.

1. Introduction

Over the last 20–30 years, Participatory Plant Breeding (PPB) has developed as a complementary strategy in crop improvement [1–3], in response to the recognition that formal plant breeding in the Green Revolution era has not provided small-scale farmers in complex, variable and marginal environments with suitable varieties [e.g., 4,6]. Lack of understanding of the conditions under which small-scale farmers grow their crops is explained as a main cause for the shortcomings of formal breeding in developing countries. Seeking farmers' involvement in breeding was a logical idea: they know best what suits their socio-economic situation, know the agro-ecological environment in which they grow crops, and crop evolution is the evidence of their expert knowledge in seed selection [7]. The concept of PPB fitted well with the general idea in the area of agricultural research and development that farmer participation could make technology more relevant to the users and, in addition, could empower farmers and rural households [e.g., 5,8]. Since the discussions about the concept of PPB and its challenges in the 1990s [9–11] a wide range of initiatives has been implemented, with different crops and in different contexts [1,2,12,13]. The initiatives included farmer-led and breeder-led ones, and farmers' participation varied between 'consultative' and 'decisive'; farmers were involved in identifying parental materials and making crossings, in selection in early generations of segregating materials (PPB) and advanced materials (PVS), in farmers' fields and on-station, and in a range of crops [e.g., 1–3,10]. Two issues are relevant in a reflection on PPB as an alternative approach in plant breeding: its success and institutionalization.

Although there is large variation in the way farmers have been involved, many if not all reports on PPB initiatives mention success: varieties that were developed outperformed in farmers' fields those available from the conventional breeding programmes, and farmers who participated were strongly empowered [e.g., 1,13]. How can the successes of PPB be understood whereas on the other hand the interaction between farmers and researchers in Participatory Technology Development (PTD) is often reported as problematic [e.g., 11,14,15]. Because farmers and researchers are part of different social worlds, they do not easily meet and when they do, collaboration is often accompanied by tension, misunderstanding and different expectations because their ways of knowing and doing are different [14–18].

Despite the repeatedly reported successes of PPB, its institutionalization so far remains problematic, as one can learn from the breeders and other players in this field.[1] The problems of institutionalization (i.e., making the alternative way of doing normal

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[1] From my personal communication with breeders and other researchers in NARs and CGIAR institutes.

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practice) are mostly attributed to the inflexibility and culture in research institutes, no incentives for the researchers to truly engage with farmers, and a lack of an enabling political climate [13,19]. There is, however, little information on the concrete limitations for researchers and institutions to make farmers' participation part of their normal practice.

This paper looks at knowledge interaction and institutionalization in a PPB case in northern Nicaragua using detailed analysis of the process and practices of making a common bean (*Phaseolus vulgaris* L.) variety by a group of actors. The analysis follows a technographic approach as described by Richards [20] and Jansen and Vellema [21; in this issue]. It presents PPB as task-oriented and collaborative work of a group of actors, in this case a number of farmers, a breeder and an NGO technician. I collected the data over a period of 12 years during visits, meetings and through interviews with the people involved.

To analyse the making of the bean variety I have made use of 'boundary' concepts. Different authors have used these concepts in somewhat variable ways to look at collective work of actors with different knowledges and to point out the difficulties involved [e.g., 17,22,24]. In this case I constructed the analysis around the boundary object as being the material or abstract object around which people coalesce and act [22,23]. The boundary object does not require consensus for successful collaboration and is sufficiently abstract or flexible to be part of different social worlds [22,23]. I looked at how the 'improved bean variety' functions as boundary object, and how it transforms from a shared goal into five candidate varieties and ultimately in the release of JM-12.7. First, I analyse how the actors come together around the boundary object, i.e., the improved bean variety, and how the different roles and knowledges of the farmers, breeder and technician become apparent in the material making of five bean varieties. In the following part of the process these five varieties and the group face a series of challenges of socio-political and institutional character. These challenges can be seen as the boundaries of the project space that the group and the varieties needed to cross in seeking acceptance by a wider social world.

2. The Nicaragua bean case: the task and the team

In 1998, farmers in Pueblo Nuevo and Condega, two neighbouring villages in northern Nicaragua, were having increasing difficulty growing common bean (*P. vulgaris* L). The pressure of Golden Mosaic Virus (GMV) had increased rapidly and none of the commonly grown bean varieties showed an acceptable level of resistance. Beans are, together with maize, the most important subsistence and cash crops for small-scale farmers in Central America. In Pueblo Nuevo and Condega, farmers traditionally produced maize and beans with few inputs because of the high risk of crop failures (droughts, hurricanes) and the unpredictability of market prices. The increase of GMV pressure was linked to the success of tobacco and tomato production in the area, which had led to an increased pressure of aphids, the vectors of the virus. When the aphids had grown resistant to chemical control the virus spread rapidly. This affected not only the tomato and tobacco crops, but also beans, which are susceptible to GMV as well. The fields in the lower and warmer parts of the villages were suffering most and growing a bean crop there had become impossible. Only the improved variety DOR 354 showed some resistance, but the red colour of its seeds was too dark to get a good price from the traders who were serving an urban market that was used to bright-red beans. In addition, farmers and their wives did not like the taste and texture of DOR 354, making it ill-suited for domestic consumption. When there was a Dutch initiative to pilot PPB approaches, the NGO CIPRES proposed a project to develop a GMV-resistant bean variety. A breeder from the national research programme (Instituto Nacional de Tecnología Agropecuaria, INTA) and 45 farmers in Pueblo Nuevo and Condega responded to the invitation to participate.

The project breeding team consisted of 45 farmers, a technician of the NGO and the INTA bean breeder. The first time they came together, in September 1999, in a start-up meeting organized by the NGO technician, none of them clearly understood what they were engaging in: PPB was new to all of them and there were no earlier experiences on which they could draw. But each of them was motivated to face the challenge. Farmers knew the type of bean they were looking for: drought resistant, adapted to low soil fertility, resistant to GMV and with a particular red colour seed for which middlemen would pay the full price. They had between 0.7 and 3.5 ha of land with an average of 2 ha, i.e., slightly higher than the average farm size in both villages. The proposition to develop their own varieties sounded quite unreal to them, but they trusted the NGO; many of them had been involved in earlier seed projects with the same NGO and knew it was serious. The CIPRES staff in Managua saw this donor-funded project as an opportunity to emphasize the importance of agricultural technologies, in particular seed, for the small-scale farmers and their contribution to national food security. In addition, it fitted their general rural development strategy to organize farmers into groups and co-operatives. Their office in Pueblo Nuevo had an office co-ordinator, and with project funds they hired a local technician who had received formal training in agriculture but till then had made his living from growing beans and tomato on rented land and from day-labouring for others. He was also well known in the village because he played in the local baseball team and had been a prominent Sandinista fighter during the contra-revolution. The breeder was sent to the meeting by his superior who had received an invitation from CIPRES for INTA to collaborate in the initiative. Later, the breeder said that he had heard something about PPB, but had never considered practising it. During the meeting, his interest and eagerness to develop varieties that farmers would adopt overcame his reservations. The limited budgets of INTA confined most of his work to the research station and he could only work outside the station when there were special programme resources from international research institutions like the Centro Internacional de Agricultura Tropical (CIAT) to pay for petrol and per diems. His engagement with the farmers and CIPRES was a personal decision. Only after insistence of the CIPRES staff with his superiors, a memorandum of understanding was signed with INTA that officially allowed the breeder to participate on the condition that he would not use his INTA time and that the NGO would pay the petrol for the INTA car he used.

3. The material making of five varieties

3.1. The experimental design

During the set-up meeting of September 1999 the group decided on the first step in the development of an adapted GMV-resistant bean variety. The breeder suggested crossing the variety that was most popular in the villages before the GMV became problematic, with GMV-resistant advanced lines he had received from the CIAT bean breeding programme in Cali. Because the crossing and production of sufficient seeds to plant trials would take more than a year, he proposed to provide the farmers with F3-seeds of 15 bean families, originating from 3 crosses that had various sources of GMV resistance [26]. With these, the breeder, the NGO technician and the farmers would start to experiment and learn about evaluation and selection until they had sufficient seeds originating from the new crosses.