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CGIAR SYSTEM-WIDE INITIATIVE 1999-2001  
PARTICIPATORY PLANT BREEDING  
ESCUELA AGRICOLA PANAMERICANO-UNIVERSITY OF GUELPH

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### **Participatory Bean Breeding Project**

The participatory bean breeding project, funded by the CGIAR System-Wide Initiative in Participatory Research and Gender Analysis, began in fall 1998. The partners in this project are the Panamerican Agricultural School, Zamorano and the University of Guelph, Ontario. The latter institution works with the project Investigación Participativa en Centro América (IPCA), which provides field support to the initiative. It was anticipated in the proposal that Zamorano would work with two other NGOs, Programa de Reconstrucción Rural (PRR) and UNIR-Zamorano. In the end, however, only IPCA was invited to participate. IPCA is funded by USC-Canada, a Canadian non-governmental organization, under its Seeds of Survival (SoS) Program. USC-Canada receives most of its funding from the Canadian International Development Agency (CIDA).

During the period under review IPCA supported 28 Comités de Investigación Agrícola Local (CIALs) in three areas of Honduras. Participatory bean breeding is being conducted with CIALs in the two main areas of IPCA's program, Yoro (municipalities of Yorito, Sulaco, Victoria) and Lago de Yojoa (municipalities of Talubé and Concepción Sur). These groups of CIALs are organized into two regional chapters (Asociación de CIALs de Yorito and ASOCIALAYO) which form part of the national association of CIALs, the Asociación Hondureña de CIALs (ASOHCIAL). The ASOHCIAL comprises over 500 members. This federated structure permits participatory breeding with a smaller number CIALs to be 'scaled out' across a much larger geographical area.

Guelph/IPCA's interest in participatory plant breeding is a response to five years of working in participatory varietal selection with the CIALs in Honduras. Despite multiple trials, in which the CIALs have tested out new and improved bean varieties through participatory varietal selection (PVS), the improved varieties frequently fail to outperform the landraces at most upper level hillside locations, when evaluated for a range of characteristics deemed important by local farmers. Specifically, at elevations over 1,000 meters, local varieties of maize have been found to outperform improved varieties approximately five out of six times, and local beans outperform improved beans four out of six times. Thus for large numbers of local farmers and the IPCA team, PPB has emerged as the means to improve local cultivars rather than to constantly look for elusive alternatives through PVS.

### **Background**

In the first phase of the research (1998-2000), IPCA (supported by IDRC-funded thesis students from the national university's agricultural school) developed profiles of

production at the two PPB sites. Two former students (Omar Gallardo and Elmer Canales) were subsequently hired by Zamorano to lend direct support to the PPB process, as part of the IPCA team. At the same time, collections of local landraces of beans from communities in the two areas were assembled. In Yorito, 6 bean landraces were identified. Oral histories, however, showed that several materials in use in the past had recently been abandoned. In the Lake Yojoa area, 14 farmers' varieties and six newer, improved varieties were identified.

The most widely used local varieties from the two areas were selected from the germplasm collections for use as parental material for the first crosses: in the case of Yorito, *Concha Rosada* was selected; in Lake Yojoa, two landraces, *Maduro Parejo* and *Vaina Blanca* were chosen. Based on farmer criteria, local socio-economic conditions, and local germplasm, Zamorano breeder, Dr. Juan Carlos Rosas, selected elite lines, which included farmers' desired traits, including resistance to diseases to which the farmers' varieties were highly susceptible. The parental materials and the succeeding generation resulting from the first crosses were maintained at Zamorano. Participating farmers were invited to Zamorano to see how beans were crossed and they and IPCA agronomists received training in breeding and management techniques at the agricultural school.

In spring 2000, the first round of third generation materials (F3) were given to CIALs in the Yorito area of Honduras. Farmers, supported by IPCA managed the materials at a "collective selection site" located in Mina Honda, one of the communities high up on the mountainside in the heart of the bean-producing area of Yorito. Four CIALs<sup>1</sup> were involved in selecting promising families resulting from the crosses; there were 120 families in total present at the collective selection site. While the plan was to simply record the selections of the different CIALs and to maintain all the materials at the site until the 6<sup>th</sup> generation (F6), CIAL members decided that they wanted to take their selections back to their own communities. This would allow them to see how the different lines adapted to conditions in their own communities and also to permit other members of their communities to evaluate materials. This was readily agreed upon. In general, this process follows the CIAL methodology in which community members are included in participatory research by means of information sessions after each round of testing.

In June 2000, Juan Carlos Rosas, Araceli Castro and Sally Humphries accompanied IPCA on a field visit to the Yorito site, which is high up on a mountainside above the community of Mina Honda. The community is an indigenous Tolupan community and land is held by the 'tribe' (*tribu*). This was the first time that the Zamorano team had visited the site and they appeared duly impressed by the layout of the trials, selection of the site, etc. They also had an opportunity to visit other CIAL experiments, most of which involved PVS with Zamorano materials. At one experiment, Dr. Rosas commented that the layout was better than most at Zamorano's experiment station. These experiments are increasingly set up by the CIALs, in conjunction with a paratechnical farmer, without

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<sup>1</sup> One group, Rincones, comprised a CIAL in the process of formation. This community was selected because of its location in a bean producing zone which did not have a mature CIAL functioning within it.

technical support from IPCA agronomists. However, in regard to the PPB experiment, IPCA, and particularly the Zamorano-contracted former student, invest a good deal of time at the PPB site. CIAL members who tend the collective site (weed, etc.) are paid for their labour; this does not occur in the case of CIAL experiments or, indeed, once the PPB materials are taken back to the communities.

Farmer evaluation of the segregating materials takes place in the field at the pod stage (*evaluación en verde*) and through grain evaluation (*evaluación de grano*). Evaluation of grain may either take place after the beans have been pulled or in the field, as the beans are being pulled. The advantage of the latter is that farmers better appreciate the nature of the plant, location, etc. and their relationship to grain production. The disadvantages lie in the risk of theft, trampling by animals, pest attacks, etc. if this process is delayed for any reason (as it was in February 2001 to allow for my presence).

The main criteria used in field evaluations, ranked by farmers in order, were disease resistance, bush bean type, good architecture and good yield and size of pod (number of beans/pod). Interestingly, the number of selections varied significantly amongst CIALs. Whereas three of the groups selected only 12%, 14% and 18% of the total for local trials, one of the CIALs insisted on including 52% of the total families in their own community trials. In retrospect, it was decided that in future CIALs should be persuaded to select according to less strict criteria at the outset, in order to avoid eliminating material early on that might be beneficial for certain traits. The approach being used is certainly one of a 'learning process approach' since for all parties this is a new process. IPCA alone has supported all field and grain evaluations.

In February 2001, I visited the four community sites in Yorito where F4 materials were being evaluated by CIALs for grain characteristics. In two of the communities, selection took place after the CIALs had pulled the beans, and in two communities, this had already occurred. In the other CIAL area, in Lake Yojoa, which was one cycle behind the Yorito CIALs, farmers had just completed F3 evaluations before my arrival in February.

In three of the Yorito communities, I conducted a short socio-economic survey of CIAL participants. The goal of the survey was to determine how representative CIAL members were within their communities, and therefore, the appropriateness of their selections for the rest of the community. However, it should be noted that the CIAL structure had already been altered by earlier changes to the methodology that were designed to make the CIAL approach more inclusive and to remove an elite bias, which had previously existed when only "research-minded farmers" were elected to the committee (See Humphries, et al., 2000). The short socio-economic inquiry demonstrated that members of the three mature CIALs, all fell into the range of owning between 1-5 *manzanas* (*manzana*=.7 hectare) of land, although all but a couple had only 1-2 *manzanas*. Based on an earlier survey, this closely approximates the average amount of land held per family in the watershed (Escolan Rodezno, 1998). None of the CIAL members interviewed consumed milk products and they generally only ate meat (chicken or pork) once a month; meat consumption exceeded this level, only occasionally during the coffee

harvest when farmers were likely to have a bit of cash in their pockets either from sales, or from labouring in someone else's coffee harvest. Again, these characteristics are typical of the majority of the hillside families in the Yorito area, where 56% suffer from food insecurity (Escolan Rodezno, 1998); regular meat and milk consumption are generally possible only amongst the wealthier families who own stores or have larger lowland plots in the valley bottom, suitable for cattle.

Another criterion likely to affect crop selection is gender. In Africa, where women make up the bulk of the region's agricultural producers, it has been found that women select crops based on criteria that are different from men. Specifically, since women are more likely to be involved in production for domestic consumption, while men are more likely to be involved in market production, it is not surprising that gender figures prominently as a criterion leading to differential selection. In Honduras, women do not typically play a leading role in field cropping activities. Instead, they concentrate their activities within the patio garden where they take care of pigs, chickens, and occasionally vegetables.

In Yorito, however, where indigenous people make up a significant proportion of the population, women seem to buck this trend. As in other Latin American countries, indigenous women play a more active role in agriculture than do *mestizo* women. And in Yorito, the CIALs have served to confirm women's legitimate role in agricultural activities. Thus even amongst those women who had never worked in cropping prior to organization in the CIALs, there is now a pride in their knowledge and understanding of what was formerly their husband's domain. Of the three mature CIALs involved in the bean selection process, which contained a total of 43 farmers, just under 50% (N=20) were women. The fourth CIAL (in the process of being formed) had no women in it as frequently occurs in the early period of CIAL formation given that the CIALs tend to stimulate greater participation of women in agriculture over time.

Based on field and grain selection conducted to-date, women in the CIALs have not employed criteria that are different from those of men. All farmers, men and women, are interested in beans both for the market and for domestic consumption. All families need to generate some cash and sell a portion of their produce after the harvest, even if this means they may have to buy beans later in the year. This is particularly the case in Yoro, where a six-month dry period tends to result in a hungry season prior to the harvest. This period, known as '*los juniros*', frequently leads people into a vicious cycle of debt forcing them to sell their crop at a low price before the harvest in order to get access to cash to purchase food. Thus, even though most farmers have little land and conform to the category of subsistence farmer, most sell a portion their crops in exchange for food and other necessities. Consequently, both men and women are interested in marketability and choose beans with this in mind. Colour, shape and size of beans are crucial for determining acceptance in the market. The only gender difference noted was that women were more observant around minute details and asked more questions than men. However, this may have been because they are less familiar with cropping activities generally than are men and hence more questioning of the different criteria; nevertheless, these criteria were the same as those employed by men. When cooking tests are

performed in the future, gender difference may well emerge since kitchen tasks remain the purview of women.

Over the course of three CIAL focus groups in Yorito organized by IPCA in July 2000, comprising a total of 17 women and 20 men, the following characteristics were identified as desirable in local bean varieties:

- *(non-trailing) bush beans, 35-40 cms in height*
- *yields of 25-40 pods/plant*
- *little disease*
- *even ripening*
- *thick stem*
- *resistant to heavy rain and drought*
- *thickish pod to prevent the beans from sprouting during wet weather*
- *7-8 beans/pod*
- *longish, thick, heavy bean*
- *dark reddish colour, shiny*
- *easy to shell*
- *firm skin to prevent pest infestation in storage*
- *produces a thick soup in the cooking process and doesn't need lard*
- *yields in the pot*
- *soft, good tasting bean*
- *cooks quickly without much fire*

*(precocity is appreciated because it allows for food/income earlier in the cycle, which is particularly important in Yorito where the hungry period (los juniros) is pronounced. However, there is a trade-off here against yield, and overall yield is considered the more important characteristic).*

Taken together, these characteristics comprise what may be considered to be the ideal type of bean (an ideotype) that farmers are hoping will result from the improved materials. Characteristics at the bottom of the list clearly refer to the culinary aspects of bean selection where gender is more likely to play a role.

Comments from farmers provided after the selection process in Yorito, February 2001, show that they are becoming conversant with the selection process. They also demonstrate their considerable interest in the process, and ownership of it:

- ✓ It makes us happy and surprised because there are things (involved in the crossing) that we didn't know about.
- ✓ It is interesting because it is for us. It could lead to a good harvest and contribute to our own independence.
- ✓ We are learning to manage things ourselves.
- ✓ It takes time and there is a cost associated with this. However, we feel that in the end we will win because the seed is for us and we will be able to sell it in other communities in the future.

- ✓ It makes us happy because we (women) didn't know how to work in this way; we only knew about patio gardens (*huertos*) and nothing else
- ✓ I feel good. The practices involved in evaluation, knowing about the diseases, etc. help us. We have failed a lot in beans; after Mitch the weather has been very variable. We hope that with our own variety, based on our own criteria, things will be better.
- ✓ I am happy because we are crossing and improving our own *concha rosada*. Now we know what bean rust (*roya*) is, what angular spot disease is; we know how to evaluate.
- ✓ Our goal is to distribute seed to the community and beyond. We want to sow a lot so we can sell it.

Findings from this assessment of farmers' interest in participatory breeding and research are very positive. Farmers' have a clear sense of investing in their future and that this is a worthwhile endeavour. They also consider their investment in learning to be very important. In this sense, participatory work is important for capacity building and for the sense of empowerment that accompanies this. This is particularly valuable for women. As one (male) farmer told me:

“Now when I return home my wife asks me about plant diseases that I have come across in the course of my day. Both she and my daughter feel confident about selling crops if someone comes to the door because they know what the going rates are; before they didn't have a clue. All the CIAL women are very independent and make their own decisions”.

Another commented:

“If the woman has to put her back into the work, she has the right to make decisions in the question of sales”.

These quotes reflect the importance of the CIAL work on gender relations. And in Yorito, in particular, gender relations have been positively affected through women's active participation in the CIALs.

### **Impacts of PPB on Institutional Players**

The PPB initiative has come at an opportune moment for IPCA and the CIALs. After 5 years of PVS with few real breakthroughs for the poorest upland communities, IPCA has embraced PPB enthusiastically, as have the farmers themselves. There are high hopes that PPB will lead to varieties that meet farmers' needs. The CIALs, if constituted as research teams that are representative of the community, lend themselves easily to such work: the farmers are well trained in running experiments and have well-developed observational skills. The federation of ASOCIALs provides the institutional mechanism for scaling-out the results. These findings are detailed in a paper presented at the 16<sup>th</sup> International Farming Systems Congress, held in Santiago, Chile, November 2000.

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