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How Participatory Research Convinced a Sceptic

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Introduction

As a plant pathologist with experience in the use of biotechnology, I describe in this chapter the process that led me to adopt participatory research approaches. When I was initially introduced to participatory approaches in Rwanda in 1990, I was concerned that I might not use my time effectively working with farmers or achieve useful scientific results. Therefore, in addition to setting up trials with farmers, I also carried out parallel on-station trials to be on the 'safe side' and not lose a season. In the course of so doing, I discovered that my work with the farmers was valuable by helping me avoid evaluating 'useless' technologies that farmers were not interested in. I have since applied, strongly advocated and supported capacity building and implementation of participatory approaches in regional bean programmes under the Pan Africa Bean Research Alliance.

'Conventional' plant breeding and technology development

Despite some change in recent years, most researchers have been hesitant to remove themselves from research stations and involve farmers in the planning, design, implementation and evaluation of agricultural technologies. This correctly represents my outlook when I worked at the University of

Nairobi in the late 1980s, before being introduced to and embracing participatory research approaches in technology development. There are a number of reasons for this reluctance. First, there is the view that research carried outside the research station is not scientific because some of the agro-ecological conditions and variables cannot be controlled and therefore data generated may not be publishable. Second, researchers opt to first test the technology in isolation and once it passes standards of scientific rigor, it is then offered to farmers. This usually happens late in technology developmental stages or when 'a finished product' is available. Third, some research working environments are de-linked and offer less interactive opportunities for researchers with extension services and farmers. Overall, farmers or end-users therefore contribute little or have no role in the development of the technology and are usually offered what in the researchers' opinion is a ready-for-use 'product'.

Researchers, based on their own experience, knowledge and criteria often define the importance of a constraint. Alternatively, farmers' or end-users' concerns or problems may be brought to the attention of researchers. In either case, researchers largely define the technological options to be evaluated (usually in on-station controlled environments) and the experimental designs to be used. In the case of crop and soil management technologies, the best performing options or packages may be offered to farmers as recommendations via the extension service, which informs through various channels (local meetings, visits, bulletins or brochures), or through demonstrations using 'progressive' farmers. In the case of varietal technologies, the traditional approaches used involve germplasm introduction or assembling, selection by breeders, and on-station testing of promising lines in preliminary, intermediate and advanced performance trials. Best lines compared to landraces may be recommended or released and their seed multiplied and distributed through formal or informal channels (Kimani *et al.* 2004). Farmers are less involved in varietal selection or may only participate in on-farm testing.

In March 1990, I joined the Centro Internacional de Agricultura Tropical (CIAT) Great Lakes Region bean research team based at the Institut des Sciences Agronomique du Rwanda (ISAR)'s Rubona station, in southwest Rwanda, as a regional pathologist. Before this appointment, I worked as a senior lecturer and researcher with the University of Nairobi in Kenya. My CIAT brief was to determine the cause and develop management strategies for bean root rots, a disease that was becoming a serious problem in the Great Lakes Region. The personal account below describes my struggle and experience in reconciling the traditional approach that I was more familiar and comfortable with and the participatory approach that was introduced to me by colleagues and how this changed my outlook towards technology development.

The question of participatory technology development

In the late 1980s, much of Rwanda and other parts of the Great Lakes Region of Central Africa experienced recurrent bean crop failures associated with increased incidence and severity of bean root rots (Trutmann & Graf 1993). Bean root rots is caused by soil-borne fungal pathogens (Rusuku *et al.* 1997) and is usually associated with areas of high population pressure, reduced land size and intensive use of land. Different stakeholders (farmers, researchers, extension service providers and politicians) expressed concern and sought solutions to manage the problem. Estimated to cause about 221 000 tons in bean production loss every year in Africa (Wortmann *et al.* 1998), root rots became a problem first in Rwanda and later in western Kenya and south-western Uganda (Opio 1998).

Following my posting as a regional pathologist in Rwanda, initial efforts to address the problem consisted of a literature review, consultations with national and regional scientists and local development agencies, and preliminary surveys of target areas to develop an understanding of the prevailing situation. As a result, the extent of the problem (60% of bean-producing areas in Rwanda were suffering from root rot), associated factors and practices were established (CIAT 1990).

Having considered the available information, I designed a research plan consisting of what to evaluate and how to evaluate. The objective was to develop effective, practical and hopefully acceptable disease management practices with genetic and cultural components. The genetic component was to be identified by evaluating and selecting bean germplasm resistant to the principal root rot pathogens and possessing other useful characteristics such that they could either be grown directly or used by breeders as sources of resistance to improve local but susceptible cultivars. Identification of cultural components involved evaluation of the effectiveness of certain cultural practices in the management of root rots. These included planting on ridges or raised beds, use of organic amendments such as farmyard manure and green manures, adjusting plant density and reducing soil acidity with lime.

The next question was 'how to test' the short list of potential options in order to establish their value 'beyond reasonable doubt'. This meant using designs that would generate irrefutable and scientific evidence and data, and demonstrate the value of selected or rejected options. To achieve this, it seemed logical to first set up on-station trials and evaluate various management options, away from farmers, for a couple of seasons to identify 'best or potential' options to offer them. My argument was that farmers expect 'ready or near-ready' technical solutions that have been scientifically tested and proven.

However, before implementing this strategy, I shared it with my colleague Louise Sperling, then a social scientist in the CIAT Great Lakes Region bean team. She had positive experiences in participatory approaches (and was in the process of evaluating participatory plant breeding approaches). Her response went counter to my plans. She strongly suggested that I consider using participatory research approaches and involve farmers from the beginning. She argued that farmers could play an important role in research and technology development if given opportunities to do so (Chambers *et al.* 1990; Sperling & Ashby 1999). Farmers should not only be considered as beneficiaries and recipients of technologies, but should be involved as collaborators at all stages of the research process, particularly at the early stages of problem identification and developing research objectives. The value of such an approach includes early definition of technologies that users are likely to adopt or reject, and adaptation of model technology to meet users' needs and preferences, hence enhancing the likelihood of increased adoption (Haverkort *et al.* 1991; Jiggins & De Zeeuw 1992). Further, in this case, which involved farmers' potentially managing a series of response options (variety and agronomic) and integrating them into already stressed systems, their early reactions on possibilities/constraints, and their fine-tuning of proposals seemed essential. Still not convinced, I held further discussions with other CIAT team members, Willi Graf (systems agronomist) and Urs Scheidegger (soil scientist and regional coordinator) who supported Louise Sperling's suggestion.

To use participatory approaches meant consulting extensively with farmers and other stakeholders and designing experiments with their input and together observing the outcome and results. My preference was to first experiment with the options in the 'privacy' of the research station before 'going public'. If the results were not good, then it would mean continuing studies to adjust what was not working until there were positive results to offer farmers. Although trained as a pathologist with long experience on bean research, I had no working experience on bean root rots. To agree with my colleagues' suggestions, raised some unnerving questions: What would the farmers think of me (as a researcher) if my suggested management options failed or gave no useful results? Why should I consider farmers' suggestions and inputs into the research design, given that they are not based on any proven scientific basis? As a 'plant doctor', I felt I was putting my reputation on the line by not having a ready or working prescription (variety or management practice) for farmers. Worse still was the admission to farmers that we had no ready solution, and instead we had to find it together.

Having considered these issues, I concluded that accepting what my colleagues suggested wholesale would surely set me up for 'failure'. Whereas I saw the value of participatory approaches, I considered it 'too risky' not to have back-up on-station experiments. Besides, reliance on farmer researcher studies only would not provide the experimentation rigor necessary to generate data for publication. Consequently, I considered it 'safe' to settle for a compromise: apply participatory approaches as proposed by and with the mentoring of my colleagues, but parallel to that to conduct on-station trials to evaluate potential root rot management options in a more rigorous manner and as a back-up strategy.

The research foci in the on-station experimentations were threefold. One was to evaluate diverse types of germplasm under screen house conditions or at hotspots for bean root rots (at the Universite Nationale du Rwanda (UNR) experimental field at Butare). The objective was to evaluate and select, under 'ideal' conditions and over a number of seasons, promising or potential sources of resistance that could be offered to farmers to choose from for further on-farm testing and/or direct use. The second focus was to assess a choice of cultural practices for their effectiveness in managing bean root rots at the hotspots. The emphasis was on practices that would enhance soil fertility and structure, drainage, and soil-living natural enemies. A third focus was to combine varietal and cultural options whose effects complement each other, for example, growing resistant varieties on raised beds and/or with effective soil amendments.

Experience with participatory research

K2

Participatory research approaches were established in late 1990 at a site (9 km west of Butare town) in the commune of Runyinya, in the southwest province

Figure 1.1 **Location of study area in Rwanda and Kenya.**

of Butare (Figure 1.1). The site was chosen for its high population pressure, low soil fertility, serious root rot problems and farmers' interest in participation. With the backing of the social scientist, Louise Sperling, I conducted a participatory rural appraisal (PRA) to assess farmers' understanding and perceptions of the root rot problem, efforts they had made, and management options they wanted to evaluate.

Due to the importance and the effect of bean root rots on production, there was great interest in finding solutions, which apparently contributed to the enthusiasm shown by farmers and the local administration in participatory technology evaluation and selection. Farmers were familiar with the symptoms and effects of root rots (Buruchara 1991). Seed treatments earlier recommended by agricultural officials had been tried, found ineffective and dropped. Application of farmyard manure, although practised on beans, was not considered a measure to manage root rots.

After the PRA, I initiated a consultative process involving farmers, researchers and extension service providers emphasizing that all partners had certain K2 comparative advantages and were to participate actively in discussions: proposing, evaluating and selecting management options. Based on this understanding, the following root rot management options were discussed:

1 Resistant or tolerant varieties.
2 Organic amendments using *Leaucaena*, *Calliandra*, coffee pulp or local weeds applied as green manures.
3 Growing beans on raised beds.
4 Reducing soil acidity using lime.
5 Reducing plant density.
6 Seed dressing (targeting *Pythium* species, which are the main cause of root rots).
7 Combining a tolerant variety with cultural methods.

However, based on views by all parties, the following options were selected for evaluation:

1 Participatory variety selection.
2 Participatory evaluation of a number of cultural methods, including:
   - Organic amendments using *Leaucaena* applied as green manure.
   - Growing beans on raised beds.

Farmers' past experiences and the likelihood that they might consider adopting the options guided this choice. For example, seed treatment did not interest anyone, due to a previous disappointing experience. In the late 1980s when root rots were becoming a major cause for concern in Rwanda, government and non-governmental extension service providers considered the use of seed treatment to manage the problem. Seed dressing – a relatively cost-effective and convenient method of protecting seeds and seedlings – was recommended countrywide under a seed treatment program (MINAGRI 1990). Seed treatment units were set up in local administrative centres and farmers brought in seed for treatment at a small fee. Over 90% of farmers who tried this method found it ineffective. The reason was understood much later when the cause of the root rot problem was found to be a *Pythium* fungus (Buruchara & Rusuku 1992; Rusuku *et al.* 1997), which is not managed by the mixture of chemicals recommended. This example illustrates an incorrect solution that led to the loss of farmer confidence in similar but correct solutions.

Another example was the farmers' reluctance to evaluate the option of reducing plant density. One of the major effects of root rots is plant loss, 3–4 weeks after germination, resulting in reduced plant stand (density). The farmers' insurance strategy is to increase seeding rates well above recommended levels so that, if there is plant loss, at least a number will remain and give some yield. However, with resistant lines, farmers find this unnecessary and reduce plant density.

Outcome of participatory research and its influence on on-station trials

I used three stages in the participatory variety selection (PVS) process. The first was the evaluation of potential sources of resistance under screenhouse conditions in soils obtained from different parts of Rwanda and naturally infested with root rots-causing organisms. This was to facilitate the elimination of susceptible germplasm, a trait undesirable to farmers but which is often 'invisible' to them. This stage identified 36 entries that showed varied levels of resistance to root rots. In the second stage, participating farmers were grouped in three clusters, each consisting of about 10–15 farmers. Each cluster was given 36 entries and these were grown in communal fields so that members could visit at regular periods and make assessments. The entries were grown in two rows, in 2-metre long plots, and farmers used their local varietal mixtures as checks. Based on these assessments, the 10 best rated entries across the three clusters were selected. In the third stage, the 10 entries were given to members of the clusters for evaluation in their individual fields in four rows in 2-metre plots. Farmers also included their local varietal mixtures for comparison. Selection in stages 2 and 3 was based on the farmers' criteria.

The five best farmer-ranked entries at stage 3 in order of preference were RWR 221, G 2333 ('Umubano'), A 300, XAN 112 and G 685 ('Vuninkingi'). RWR 221 was ranked best because of: (a) its resistance to root rots; (b) good performance in conditions of low soil fertility; (c) high yield; and (d) good vegetative growth. Other positive attributes were good seed taste, shorter cooking time and tasty leaves. Two negative attributes were its long growing cycle and its susceptibility to anthracnose, a fungal disease. Based on its positive attributes, participating farmers named it 'Rwandarugali' meaning that it had potential to be widely grown in Rwanda. This farmer-given name was K2 subsequently adopted as the official name by the national bean programme when releasing the variety.

G 2333 (‘Umubano’) was rated second, but its susceptibility to *Fusarium* wilt prevalent in the trial areas was cited as a major negative attribute. The third ranked A 300 did well under good soil conditions but most farmers had reservations because of its poor performance in less fertile soils (Buruchara & Scheidegger 1993).

It took three seasons (1.5 years) to get to the decision reached in stage 3. Thereafter, efforts were focused on seed production and on wider adaptation, evaluation and dissemination. This is a much shorter period than would have been the case under a conventional breeding scheme, which normally takes about 4 years (Sperling & Berkowitz 1994).

As expected, on-station evaluations involved rigorous assessments of germination, plant stand at various growth stages (four), disease severity on roots (based on destructive sampling), and dry matter production at flowering and yield. Other assessment included evaluating the effects of integrating selected cultural methods and promising varietal components. The outcome of stage 3 of PVS evaluations were considered and resulted in adjusting the type and number of entries that were subsequently used in on-station trials. I mainly included the 10 entries selected by farmers. In subsequent varietal–cultural integrated trials, RWR 221 was largely used because of its acceptance by farmers.

Participatory evaluation of selected cultural practices was done in individual plots in the three clusters described above. The effects of organic amendment and raised beds on root rots were evaluated during the second and first seasons of 1990 and 1991, respectively. Outside valley bottoms, raised beds are widely used in the northwest Rwanda provinces of Ruhengeri and Gisenyi where rainfall is high. The beds increase aeration and soil temperature, decrease soil moisture, promote deeper and greater root formation, and allow farmers to plant at random – ‘their own way’. Organic amendment with *Leaucaena* was the most appreciated option by farmers because of its effect in reducing plant loss, increasing yield and vegetative growth (for leaf consumption), and its positive residual effect on sorghum grown after beans (CIAT 1990). The main constraint was the availability of sufficient quantities. As a result, farmers in the trial area expressed interest in producing green manure as hedgerows or on contours. To address this emerging interest, a new partnership was initiated with a development project supported by the Food and Agriculture Organization (FAO) and an ISAR/ICRAF (International Council for Research in Agroforestry) collaborative project that helped to establish five farmer-managed nurseries. Subsequently, several thousand seedlings of agroforestry species were distributed to collaborating farmers in the project area (Buruchara & Scheidegger 1993). These efforts were, however, interrupted by the war in 1994.

Farmers observed that the use of raised beds neither reduced disease severity nor increased yields. Their high labour demands were also considered an added disadvantage. The farmers, therefore, suggested that we abandon further evaluation of raised beds. This decision also influenced me to eliminate this treatment from my on-station trials since its likelihood for adoption was limited. However, planting on ridges (50 centimetres apart) was considered as an alternative to raised beds and evaluated in participatory and on-station trials. Although appreciated during periods of high rainfall, farmers considered ridges laborious, and their effects inconsistent and dependent on soil moisture (Buruchara 1995).

One of the questions was whether parallel experimentation was necessary. For reasons explained above, factors evaluated in participatory trials were concurrently evaluated in on-station trials but with experimental designs that were more complex. The parallel on-station trials were maintained as insurance and back-up to the participatory trials, whose results were assumed less predictable and potentially doubtful. Results from on-station trials would form the basis for designing further on-farm trials or recommendations. In other words, on-station trials were supposed to be the ideal basis for developing management technologies. To my surprise, there were great similarities and agreement of results obtained for common factors evaluated (varieties, organic amendments, raised beds and ridges) when comparing the two approaches (Buruchara 1995). Obviously, it was a useful and valuable contribution to first identify resistant entries to the main local (invisible to the farmer) constraint in on-station (screenhouse) trials. On the other hand, results from participatory research influenced and significantly altered the original on-station trial design, plans and assumptions after two seasons.

The participatory research process made it possible to identify farmers' preferences and limitations associated with practices that I had suggested evaluating in on-station trials. Second, it allowed continuous assessment of results by farmers and modification of the design or options (treatments) in subsequent evaluation. What was most significant (and least expected) was the fact that results obtained from participatory research led to the adjustment and even discarding of some of the treatments I had initially suggested for on-station research. I thus avoided wasting time and efforts evaluating options that would never have been considered by farmers for adoption, let alone testing. For example, I dropped the raised bed treatment after two seasons and replaced it with small ridges, discarded two organic amendment options and only retained *Leaucaena* and *Calliandra* as possible candidates, and eliminated the plant density treatment since farmers made adjustments depending on the resistance of the variety.

A similar problem, a different approach: lessons from Rwanda and their application in western Kenya

The bean root rots problem in western Kenya, particularly in the Vihiga and Kakamega districts, became apparent in 1991. Many farmers gave up growing beans, given the near-total losses they were experiencing, and sought assistance from local extension and research systems (Otsyula *et al.* 1998). In turn, the Kenya Agricultural Research Institute (KARI) sought the assistance and collaboration of CIAT in addressing the problem, which resulted in my involvement. In many ways, the problem was similar to that in Rwanda (Nderitu *et al.* 1997). Regional partnerships and linkages were key in taking advantage of the experiences and lessons learnt in Rwanda, which incorporated farmers' knowledge and resources in addressing the problem.

Adaptive research using participatory approaches was used from the beginning to evaluate the effects of root rots management options (Otsyula *et al.* 1998). There were no on-station evaluations. Partnership between farmers, development (Association for Better Land Husbandry (ABLH) and the Ministry of Agriculture's extension services) and research (KARI, African Highlands Initiative (AHI) and CIAT) partners diagnosed the problem and agreed on management options to consider for evaluation.

Twenty-six bean lines resistant to root rots in Rwanda were introduced in 1993 to western Kenya with the objective of using participatory variety selection approaches. These, together with local germplasm (300 entries), were initially evaluated for their resistance to root rots in two communal plots (farmers' fields) that were hotspots, over two seasons (1994a and 1994b) with the participation and input from farmers. Because of the ideal root rots conditions; it was easy for farmers to assess and select resistant or tolerant germplasm. Almost all were susceptible. In 1995, farmers evaluated the 10 best ranked lines in individual plots based on high yield and early maturity as some of the selection criteria. Across the two districts, five lines (MLB-49-89A, SCAM 80-CM/5, RWR 719, RWR 432 and MLB-40-89A) were rated best following extensive farmer evaluation (Otsyula *et al.* 1998).

A surprising outcome was the selection of a black-seeded line, MLB-49-89A, because of its resistance to root rots, early maturity, fast cooking and good taste. A black-seeded bean was something new and was considered an unacceptable trait in Kenya. The conventional wisdom was to offer farmers varieties with preferred seed characteristics. In this particular case, only varieties that were susceptible to root rots were eliminated leaving the final selection decision to farmers. The outcome was a useful lesson. Most farmers evaluated and selected the black-seeded line, which later achieved widespread adoption. A survey in 2001 showed that MLB-49-89A (KK15, KK standing for KARI Kakamega) was adopted by 80% farmers in the Vihiga district (Odendo *et al.* 2005). Recent studies showed that MLB-49-89A, though black and traditionally not having a preferred seed type, remained a highly demanded variety (Otsyula *et al.* 2004).

Participatory evaluation of crop and soil management practices in western Kenya focused on fertility improvement options, including organic amendments – mainly farmyard and cow manures, a range of green manure (*Calliandra*, *Acanthus*, *Sesbania*, *Tithonia, Mucuna*, *Crotolaria* and *Dolichos lablab*) and buckwheat (IPM report of AHI; Otsyula *et al.* 1998) – and inorganic fertilizers, particularly urea, NPK (nitrogen, phosphorus and potassium) and DAP (diammonium phosphate). Other practices included planting on ridges, earthing-up when weeding, and adopting various combinations of the above practices and tolerant varieties. Resistant varieties and farmyard manures were the most preferred options. Crop tolerance was improved by the application of green manure. As in Rwanda, the effect of growing beans on ridges was not apparent and (given that maize and beans are intercropped) the method was not considered practical.

Two to 3 years after the initiation of efforts to manage bean root rots in western Kenya, farmers again started growing beans. A working relationship between farmers, researchers, governmental and non-governmental organizations (NGOs), was extremely beneficial (Buruchara *et al.* 2000). The NGOs' field logistic advantage provided researchers with opportunities to reach many farmers to evaluate potentially useful technologies. The adoption rate was high, not only because farmers were involved in identifying technologies to a major production constraint, but they also considered options compatible to their production systems. Given the increased demand for these new varieties, K2 farmers who participated in evaluations became seed producers and suppliers. Partnerships both within and between the countries resulted in savings in resources and time that benefited farmers.

Scaling-up of participatory research at the regional level

The experiences described above and those of other CIAT colleagues such as Louise Sperling, Joachim Voss, Urs Scheidegger and Willi Graf who worked in Rwanda in the late 1980s and early 1990s, contributed to forming the basis for advocating the involvement of farmers and other stakeholders in technology development within the bean research networks in Africa (Sperling *et al.* 1993). Currently, PRAs are considered critical elements in research and development programmes under the Pan Africa Bean Research Alliance (PABRA) following efforts to scale them up. Participatory plant breeding/participatory variety selection (PPB/PVS) are increasingly taken up as components of decentralized bean breeding strategies. Recent evidence in Ethiopia, Tanzania and Uganda reinforces earlier observations that participation of farmers in the selection process brings in additional selection criteria different and complementary to those of breeders. It also creates additional opportunities to select for adaptation to a wider range of target environments than is possible with on-station selection (Sperling *et al.* 1993; Buruchara *et al.* 2004; Kimani *et al.* 2004). As a result, there has been a conscious effort to advocate for and enhance the capacity and skills of PABRA partners in participatory research approaches (Buruchara *et al.* 2004; Kimani *et al.* 2004). In 2004, one out of two breeders in PABRA countries were applying PPB/PVS at various stages of variety development (PABRA 2006). The time taken to develop a variety in Uganda has shortened compared to
1 the previous years (Namayanja *et al.*, in press) and the participatory approach is linked to recent releases of varieties in the Democratic Republic of Congo (five varieties), Uganda (two varieties) and Ethiopia (one variety) that are acceptable to farmers and traders.

Adaptation of participatory approaches has not been without challenges. As in my case, scepticism is a major obstacle to overcome. Others include limited knowledge and skills to implement effective participatory approaches. Limited resources, particularly funds, time and land in farmers' fields, present challenges and operating at sites far from research stations limits the scale of operation and application. Scarcity of land, especially in densely populated areas, limits the amount of germplasm that can be evaluated in each farm.

Potential for combining PPB/PVS with biotechnology tools

In developing technology options through plant breeding, Schnell (1982) suggests five sequential stages that include: (a) defining breeding objectives; (b) acquiring or generating genetic variation (from collections or farmers' fields, and/or through crossing); (c) selecting among the variable materials; (d) testing and characterizing the selections; and (e) multiplying and disseminating seed. This process is often achieved through conventional breeding. However, it is increasingly appreciated that PPB can also play a complementary role and contribute in each of the five stages. The difference between the two depends on the types of various interest groups (researchers, farmers, traders, NGO workers, processors, extension agents, women, etc.), the roles played and the level of involvement (Sperling *et al.* 1993). Just as in PPB, biotechnology tools can also contribute in the five stages through broadening the range of objectives and making it possible to address objectives that cannot be pursued through conventional breeding. They increase the range of genetic variation available; enhance the accuracy and efficiency of selection; and test and speed up the multiplication and dissemination of new planting materials, e.g. through tissue culture (Thro & Spillane 2000) (Figure 1.2).

Marker-assisted selection (MAS) is one of the tools that the CIAT and National Agricultural Research System (NARS) partners are currently integrating into varietal selection schemes. Based on genetic markers that are closely linked or associated with traits of interest (some of which are 'invisible' to farmers), MAS speeds up, increases precision and improves the effectiveness of selection. Selection can be done early in the plant growth, in the absence of the constraints or traits that are difficult to manage, and is useful in the combining and simultaneous evaluation of several traits. MAS can also shorten the breeding cycle. Traits on which MAS is currently applied include resistance to key diseases in Africa (*Pythium* root rots, angular leaf spot, anthracnose and bean common mosaic virus). The benefits of combining MAS with PPB/PVS (Figure 1.2) and how biotechnology tools can better meet farmers' preferences for traits or can make the PPB process effective and efficient is being explored.

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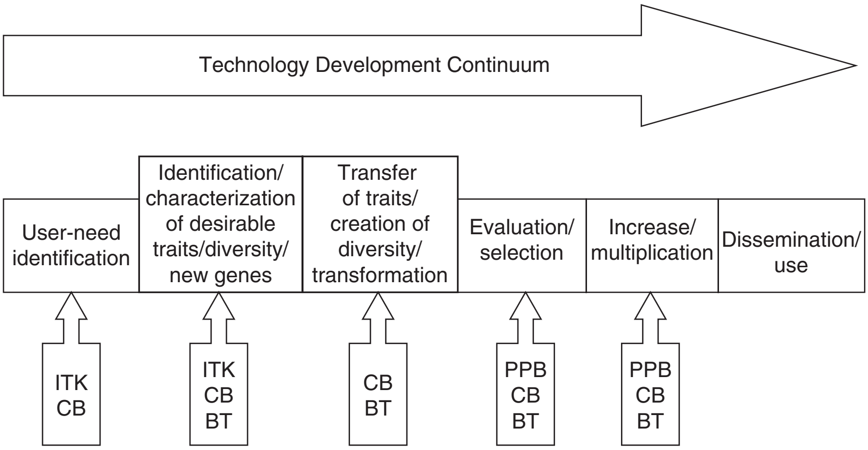

Figure 1.2 **Complementary role of conventional breeding (CB), participatory plant breeding and/or participatory variety selection and biotechnology (BT) at different stages of variety development. ITK, indigenous technical knowledge; PPB, participatory plant breeding. (From Buruchara 2003.)**

Conclusions

The experience described above clearly shows the advantages of using participatory approaches. The approach was effective in identifying new and acceptable bean varieties in a relatively short time (2–3 years), making savings in both time and resources by avoiding testing 'useless' technologies that may have had no chance of adoption. The approach increased the probability for adoption and resulted in early benefits. In the Kakamega and Vihiga districts of western Kenya, some participating farmers quickly identified opportunities for producing seed, which they sold to neighbours. The new varieties improved the food security and welfare of 98% and 99%, respectively, of surveyed households. A third of the farmers in both districts reported having more beans to eat at all times of the year due to the high productivity (Odendo *et al.* 2005).

Early and continued involvement of end-users, or considering their criteria, provided valuable feedback to researchers and to the technology development process. In addition, varietal preferences by participating groups reflected preferences of the wider population in target areas. Studies carried out in 2001

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showed that four out of five lines selected by the majority of farmers were being grown by 35–80% of households (Odendo *et al.* 2005).

A major lesson I learnt is, 'Never stereotype farmer preferences; they use a complex set of criteria. Farmers need to be offered a wide range of prototypes and left to make the choice.' The selection and wide adoption of the black-seeded line, MLB-49-89A (KK15), which 'normally' would not have been offered to farmers (because black is not considered a preferred seed colour), is a case in point.

NGOs played a critical role in mobilizing farmer groups, not just farmer individuals. However, farmers and researchers have to invest both time and resources to learn from each other – from my experiences, neither had regrets.

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