Revisiting approaches and methods of generating and utilizing socio-economic information and knowledge : Lessons from field experience

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Abstract

This paper aims at reviewing three sociological experiences carried out at the Regional Centre of National Agricultural Research Institute (INRA), Settat, Morocco. Selected studies include the baseline, in situ conservation research, and farmer's participation in barley variety development. The main objective of the review is to draw lessons in terms of adopted approaches and methods and utilization of generated socio-economic information and knowledge. The review clearly indicates a considerable evolution in the role of social science from simply assisting biology and agricultural research whenever needed or deemed useful to being a crucial component of integrated participatory research at INRA. It is argued that occurred evolution may be explained by the paradigm shift in global scientific research focus from production to people-centered research. Several lessons are learned from reviewed experiences. Because of its comprehensive character and adopted methodology, the baseline work indicates that this type of study can provide biological and agricultural research programs with relevant information to streamline their specific activities. The in situ conservation research experience offers several important lessons. The first lesson is the empirically grounded basis for farmers' use and maintenance of crop landraces. The second lesson concerns the complex nature of in situ conservation of agricultural biodiversity. The third lesson points to the necessity of participatory approaches and strong multidisciplinary teams in this type of research. The fourth lesson pertains to the correspondence between women and farmers' knowledge systems and experiment based results. Farmer participation in barley variety development has a threefold advantage as opposed to conventional breeding. It builds better understanding of farmers' selection criteria and desirable variety characteristics, greater confidence in research results among farmers and stronger efficiency in achieving results. In conclusion, reviewed experiences clearly point to the need for generating relevant socio-economic information and knowledge and the value of their integration into interdisciplinary research programs. These experiences also demonstrate that well thought of approaches and methods are crucial to obtaining results that can rapidly be used.

Key words: Baseline, in situ conservation, participatory plant breeding, landraces, multidisciplinary, women's knowledge, people-centered research

ملخص

تطرق هذا المقال إلى مراجعة ثلاث دراسات من بين الأبحاث السوسيولوجية المنجزة بالمركز الجهوي للبحث الزراعي بسطات هي 1) دراسة المعطيات القاعدية (1990–1993)، 2) البحث السوسيواقتصادي المرتبط بحفظ التنوع البيولوجي– الزراعي في عين المكان (1998–2001)، و 3) مشاركة المزارعين في إنجاز أصناف الشعير(1997–2002). وتهدف المراجعة إلى استخلاص الدروس من حيث المقاربات والمناهج المستخدمة و استعمال المعلومات و المعارف السوسيوقتصادية المحصل عليها. و قد أظهرت المراجعة أن هناك تطورا هاما في الدور الذي تلعبه الأبحاث السوسيولوجية بالمعهد الوطني للبحث الزراعي، إذ تم الانتقال من مجرد دور الوسيط و المساعد للعلوم البيولوجية و الزراعية حسب الحاجة إلى اعتبار البحث السوسيولوجي مكونا حيويا ضمن الأبحاث التشاركية المندمجة و المتعددة الاختصاصات التي تنجزها فرق متكاملة من الباحثين بالمعهد. و يمكن تفسير هذا التطور و لو جزئيا بالتغير الحاصل في نماذج البحث العلمي من التمحور حول الإنتاج و التكنولوجيا إلى التمركز على الإنسان. و تشمل الدروس المستخلصة العناصر التالية : نظرا للطبيعة الشمولية للدراسة القاعدية واستخدام طريقة الاستمارة في إنتاج المعلومات، فإن هذا النوع من العمل يكون مفيدا و ذا جدوى لمساعدة برامج الأبحاث البيولوجية و الزراعية المختلفة. أما الدروس المستخلصة من أبحاث حفظ النباتات المزروعة في عين المكان لدى المزارعين فهي كما يلي: 1) الطبيعة المعقدة للمحافظة على التنوع البيولوجي الزراعي في عين المكان، 2) الأساس التجريبي لاستعمال المزارعين للأصناف المحلية و احتفاظهم بها، 3) ضرورة توفر فرق عمل قوية و متعددة الاختصاصات و استخدام مقاربات تشاركية في الأبحاث المتعلقة بالحفظ في عين المكان، و 4) تطابق معارف المزارعين و معارف النساء من جهة و تطابق هذه الأخيرة و نتائج الأبحاث القائمة على التجريب العلمي من جهة ثانية. هناك جوانب إيجابية ثلاثة لإشراك المزارعين في إنتاج أصناف الشعير مقارنة مع تربية الأصناف بالطريقة الكلاسيكية. إذ يسمح بالإطلاع على و فهم المعايير التي يستخدمها المزارعون في اختيار الأصناف و المواصفات المرغوب فيها و المفضلة لديهم بصورة جيدة. كذلك تتكون لدى المزارعين ثقة أكبر في نتائج البحث العلمي مع فعالية أكبر في الحصول على النتائج. و كخاتمة أظهرت المراجعة بوضوح أن إنتاج معلومات و معارف سوسيوقتصادية موائمة و مفيدة و إدماج هذه المعارف في برامج بحثية متعددة الاختصاصات مهم و ضروري للمؤسسات المعنية بالأبحاث الزراعية.

الكلمات المفتاحية : الدراسة القاعدية، الحفظ في عين المكان، إشراك المزارع في انتقاء الأصناف، تعدد الاختصاصات.

Résumé

Dans ce travail, trois études sociologiques réalisées au Centre Régional de la Recherche Agronomique de Settat, Maroc ont été revisitées. Il s'agit de l'étude de base (1990-93), l'étude socio-économique de la conservation in situ de la biodiversité agricole (1998-2001), et la sélection paysanne des orges (1997-2002). L'objectif de la revue est de tirer les principales leçons en termes de génération et d'utilisation des données et des connaissances sociologiques. Au fil des années, une évolution considérable s'est opérée dans le rôle de la sociologie à l'INRA. Ce rôle a changé de la simple assistance aux sciences biologiques et agricoles selon les besoins pour devenir un composant crucial des recherches participatives intégrées de l'institution. Une telle évolution est due, au moins partiellement, aux changements des paradigmes de la recherche scientifique d'une focalisation sur la production et la technologie à un centrage sur l'homme. Plusieurs leçons ont été apprises au cours de cette revue. L'adoption des méthodes formelles et le caractère compréhensif de l'étude de base confirment l'utilité de ce type d'études pour fournir des informations et des connaissances pertinentes aux programmes de recherche agricole. L'étude sur la conservation in situ de la biodiversité agricole a permis de tirer les leçons suivantes: 1) la nature compliquée de la conservation in situ de la biodiversité agricole étant donné la multitude des facteurs engagés dans le processus; 2) l'utilisation des variétés de terroir par les agriculteurs et leur sauvegarde de ce patrimoine a une base empirique; l'étude de la conservation in situ nécessite inéluctablement des approches participatives et des équipes pluridisciplinaires solides et l'existence d'une correspondance intéressante entre les connaissances des femmes et des hommes d'une part et entre ces dernières et celles issues des travaux d'expérimentation d'autre part. L'implication des agriculteurs dans le développement des variétés d'orge a un triple avantage par rapport à l'amélioration génétique conventionnelle. Cela permet une compréhension des critères de sélection des agriculteurs et des caractéristiques désirées dans les variétés, une plus grande confiance de la part des agriculteurs dans les résultats des recherches et une meilleure efficience dans l'obtention des résultats. Pour conclure, la revue montre clairement l'utilité de produire des informations et des connaissances sociologiques pertinentes et la nécessite de leur incorporation dans les programmes de recherche interdisciplinaire dans une institution de recherche agronomique.

Mots clé : Etude de base, conservation in situ, sélection paysanne, variétés de terroir, multidisciplinarité.

Introduction

This paper aims at reviewing three sociological experiences carried out at the National Agricultural Research Institute (INRA), Settat, Morocco. Selected studies include the baseline, in situ conservation research, and farmer's participation in barley variety development.

The baseline study represents the first major work carried out at INRA Settat by the team of sociologists of which the field work was achieved in 1990. The objectives of the study were to (1) identify and categorize the various farming systems of the region, (2) to develop operational descriptions of the internal organization of each farming system, and (3) to provide a benchmark of useful and accessible information to inform on-going technology research and transfer for the region (Moore et al., 1993). The sociological work of the in situ conservation research was an integral part of the Moroccan component of the project on "strengthening the scientific basis of in situ conservation of agricultural biodiversity" in collaboration with the International Plant Genetic Resources Institute (IPGRI). The main objectives of Morocco's component were (1) to promote the effective participation of farmers, women, local governmental institutions and non-governmental organizations in implementing in situ conservation of chosen crops in selected sites, and (2) to strengthen the national capacities among researchers and development agents as well in the area of in situ conservation (Birouk and Mellas, 2002).

With respect to farmer's participation in barley variety development, it is important to note that for many Moroccan farmers, especially limited resource farmers, barley means a strategic crop allowing them to primarily secure animal feed and human consumption as well as facing climatic uncertainty and vulnerability of production environment (Nassif and Amri, 2003; Nassif et al., 2003). The predominant barley breeding research in Morocco has been based on multi-location selection and evaluation at experiment stations and on the introduction of shared germplasm developed at ICARDA. At best farmers were asked to evaluate newly released varieties after their registration through on-farm testing. Starting in the 1996-97 cropping season, the participatory plant breeding approach was introduced in Morocco in collaboration with ICARDA with the objective of increasing the relevance of breeding to barley producers and developing barley varieties under more representative barley production conditions. With this type of research, not only did farmers effectively contribute in the selection of barley material while still being observed and studied by the breeder, but the breeding material itself was sown in their fields and grown under their real conditions. Thus, the participatory plant breeding (PPB) work carried out over the period 1997-2002 aimed at 1) conducting the selection and evaluation processes under more representative barley production environments and farming conditions, 2) understanding farmers' selection criteria, 3) encouraging and strengthening farmers' participation in variety development, and 4) providing farmers with a wide range of material with greater adaptation potential to their specific natural and socio-economic conditions (Nassif and Amri, 2003).

The present paper focuses on reviewing the three studies identified above in terms of adopted approaches and methods in order to draw lessons regarding the utilization of generated

socio-economic information and knowledge and their relevance to biological and other technical disciplines.

Approaches and methods

As noted above, this paper reviews three studies which are the baseline study, the socioeconomic component of in situ conservation project and farmer's participation in barley variety development in Morocco. Consequently, this section summarizes approaches, methods and techniques used in each of the three studies.

The approach adopted in the baseline study was based on the farming systems research and development /extension tradition. Since the main objective of the work was the characterization of systemic conditions influencing the adoption or rejection of new agricultural technologies, the focal point chosen was the farm-household. The woking definition of farming system which guided the whole was that provided by Norman and Gilbert who stated that "The specific farming system adopted by a given farming household results from its members, with their managerial know-how, allocating the three factors of production (land, labor, and capital) to three processes (crops, livestock, and off-farm enterprises) in a manner which, with the knowledge they possess, will maximize the attainment of their goal (s)"(1982:17).

The sampling framework was developed with the assistance of specialized units of the Settat and Safi Provincial Directorates of Agriculture (DPA). Sample size was determined on the basis of cost, time and required quality and quantity of farm-household level information. Farm and household questionnaires were elaborated by the sociology team with inputs from other researchers to address the full range of quantifiable activities found in the region. Once the questionnaires were elaborated, they were thoroughly pre-tested. In order to insure the quality of collected data throughout the data collection process, several surveyors have been recruited and trained (Moore et al., 1993).

The adopted approach in carrying out the sociological component of the in situ conservation research was developed through a long concerted process of discussions within the overall project team. This process resulted in consensus regarding needed information, focal areas and methodological tools to achieve desired objectives. More importantly, there was an emphasis on ways of integrating key socio-economic variables such as gender, ethnicity, and socio-economic status in other data gathering efforts as well as in decision-making. In fact, the sociology discipline was integrated with biological disciplines from the very early stages of the research conception and implementation (Birouk and Mellas, 2002; Nassif and Birouk, 2003). In implementing the sociological work, methods used combined formal surveys with participatory techniques. The selection of study sites and initial formal surveys were conducted by multi-disciplinary teams with representative samples of farm-households in each of selected villages. The questionnaire used was also developed by the project team and was administered to about 60 heads of farm-households in each of the three sites. The questionnaire emphasized target crop production, cropping systems and practices, varieties

of grown crops, comparison between local and improved varieties, sources of seed, and end use of crop production. A total of 173 male farmers participated in the surveys (Nassif and Mahdi, 2002).

In addition, focus groups discussions were conducted with groups of women from the same farming communities. Discussions focused on the role of women in crop production and use, their participation in key farming decisions, their knowledge of used varieties, and desirable characteristics of preferred varieties. The objectives of the work with women were to: (1)examine issues insufficiently covered in questionnaire based surveys, and (2)understand women's views and perspectives regarding the use and conservation of crop landraces of selected crops. A total of 89 women participated in these group discussions. Training workshops, field visits, and other participatory techniques were also used to capture farmers' perceptions and knowledge systems with respect to cropped plants and to identify ways of strengthening existing practices towards better conservation of crop genetic diversity and provision of greater benefits to farmers and their families (Nassif, 2002).

The participatory plant breeding approach used in the case of barley in Morocco consisted of involving barley producers in the selection of barley material while still being observed and studied by the breeder. Moreover, the breeding material itself was sown in their fields and grown under their real conditions. Farmer participation in barley variety development has a threefold advantage as opposed to conventional breeding. It builds better understanding of farmers' selection criteria and desirable variety characteristics, greater confidence in research results among farmers and stronger efficiency in achieving results.

The methodology used was primarily based on the implementation of a series of trials each year at several farmers' fields representing varying barley environments. Identifying pertinent sites and cooperating farmers was of utmost importance. Over the years, collaborating farmers were from mountain, semi-arid and arid zones. Selected sites represented typical environments of barley production. Moreover, the five provinces of Settat, Safi, Essaouira, Khouribga and Khémisset where PPB trials were implemented covered over 30% of barley area in Morocco. The two main INRA breeding stations at Merchouch and Jemâa Shaim represented favorable and less favorable environments respectively (Nassif et al. 2003).

Experimental lines of observation nurseries SEGMAG and NURMAG were unreplicated while included checks were replicated twice or three times. The latter represented the most widely grown barley local populations and best available newly released varieties in the Maghreb countries. These nurseries were planted in 2 rows of 2.5 meter long and 0.30 meter row spacing. MORYT and PPBMOR trials were planted in two blocs with 2 replications in 6 rows of 2.5 meter and 0.30 meter row spacing. At each site, cooperating farmers and their neighbors evaluated planted material in their fields at late tillering and physiological maturity stages. The evaluation consisted of a visual selection of best lines accompanied by stating the reasons behind choosing such lines. Farmers' selections and views were recorded immediately during the selection process. The national breeder also performed the selection at farmers fields and at the research stations. Reactions to diseases and plant height were noted and grain and straw yields were measured for MORYT and PPBMOR.

Implemented trials were accompanied by short focused surveys with cooperating farmers and their neighbors on barley production, end use of barley and desired traits in barley varieties. Also, field days and inter-site visits were conducted. Farmers also had the opportunity to visit the same trials at the research stations. During the 1998-99 cropping season, 10 men and 10 women from two sites including cooperating farmers and their wives were solicited to evaluate 10 barley grain and spike samples using a simple ranking technique from most to least preferred types. The ranking procedure was coupled with short interviews with women and men separately. Barley samples included 6 and 2 rowed types, old as well as newly released barley varieties.

Results and discussion

It must be remembered that the focus of this paper is rather on adopted approaches and methods and learned lessons than on achieved specific scientific results. Consequently, this section presents selected general findings to provide the basis for the discussion on approaches and methods and learned lessons.

In the case of the baseline study, the two major achievements were the farming systems typology and the developed baseline data set itself. While the latter provided information on varying features of agricultural production and farm-family livelihood of surveyed farm-households, the typology revealed important specific characteristics of typical systems. The data set included Information on crop management practices, livestock management practices, women's contributions, livestock production, etc.. It also described the diversification of production, income generating options, and other processes. Similarities were used to define research and recommendation domains. Differences were taken into account in the design and implementation of agricultural technology for the region (Moore et al., 1993).

Findings of the in situ conservation work covered (1)farm-household and farmer characteristics; (2)prevailing farm systems and the place of target crops in these systems; (3)farmers' generalized use and high appreciation of target crop landraces; (4)farmers' reasons for maintaining landraces; (5)farmers seed management and sources of annual seed; and (6) the important contributions of women to crop production, processing and utilization and their valuable knowledge about studied crop landraces (Nassif, 2002; Nassif et al. 2002).

Findings of the participatory plant breeding research on barley included a) several promising lines selected by farmers and breeders at each site, 2) a better understanding of farmers' know-how and ability to choose among hundred lines, of farmers' selection criteria and the importance attributed by farmers to barley straw, 3) a better knowledge of farmers and women's perceptions of the crop and the special place farmers assign to barley landraces, their preference of six rowed varieties, their knowledge and capacity to contribute to variety development (Nassif and Amri, 2003; Nassif et al., 2003).

Revisiting approaches and methods

At the time of the conception and implementation of the baseline study, INRA -Settat was conducting several research programs with the objective of developing appropriate technologies for farmers in arid and semi-arid areas. More precisely, a lot of experimentation was conducted on- station as well as at farmers' fields. But little was known on the socioeconomic environment under which farmers operated their farms, farmers' resources, their practices, their constraints or any of the socio-economic features characterizing farming systems in arid and semi arid areas. Moreover, INRA -Settat was also undertaking a long process of defining research priorities based on the Planning By Objective approach (Moore et al., 1993). Emphasis in the sociological effort was put on establishing a comprehensive data set that will serve the diverse needs of biology and technical disciplines and will provide a frame of reference for continued dialog between farmers, researchers and development agents (Moore et al., 1993). As a result, survey techniques were the primary tools with emphasis on quantitative data, sampling procedures, and statistical analysis in order to facilitate and encourage other researchers' access to the data set and their use of generated information. While a good many INRA scientists have contributed with insights and ideas especially in the form of desired data points and information, the whole process of undertaking the baseline study was achieved by INRA Settat sociology team and hired surveyors.

During the last decade, the need for in situ conservation of biological diversity has been internationally recognized and promoted. As defined in the Convention on Biological Diversity, "in situ conservation means the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in the natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their properties" (FAO, 1998:51).

Undoubtedly, conservation and sustainable utilization of crop landraces on-farm are the best means for preserving plant genetic resources for food and agriculture. Crop landraces commonly grown by farmers in different regions of Morocco have certainly evolved under farmers' practices and natural environment changes. Crop producers and users have different perceptions and end-uses of grown crops. By depending on genebanks as the only mean for conservation of crop genetic resources, not only is this evolutionary process being destroyed but the stored material may not be of great value without the practice and knowledge that made it what it is. Consequently, in situ conservation of crop landraces on-farm was a necessary complementary way to ensure the preservation of evolutionary and adaptation processes and the diversity embodied in the crop and prevailing agro-ecosystems. Breeders more than any other scientists must be concerned with these processes (useful germplasm, farmers' desired traits and selection criteria).

In addition, in situ conservation on-farm harbors opportunities for mutually reinforcing conservation objectives with development goals. In situ conservation of plant genetic resources is not only suitable for conservation purposes but it can contribute to improve local people and farmers' livelihoods. Moreover, it is a necessary prerequisite for sustainable

agriculture especially in dry areas. In situ conservation of crop landraces on-farm is also a means to recognize and valorize farmers' contribution to maintaining crop genetic resources.

In the light of these considerations, the essential of the sociological contribution in the the in situ conservation research activity during the first phase of the project was effectively conducted by multi-disciplinary teams. Participatory and survey techniques were used. Attempts were made to effectively incorporate the socioeconomic work with plant based research and activities especially in organizing training modules, field visits and inter-sites tours. In fact, several workshops have been implemented have been held to achieve this harmonized team perspective (Birouk and Mellas, 2002).

The participatory plant breeding approach particularly in the case of barley was badly needed because conventional barley breeding was more responsive to favorable environments and high input production conditions which hardly apply to barley production areas in Morocco. Newly released barley varieties were hardly used and praised yield gains of improved varieties were hardly obtained under farmers' conditions. Most often , there were no significant correlations for barley grain yield between experimental stations and farmer sites. Also, the participatory plant breeding experience was necessary as a learning opportunity for breeders to sharpen their knowledge of the plant with some understanding of producers and users' perceptions, needs and preferences and the conditions under which barley is widely produced (Ceccarelli and Grando, 1999). Only such an approach could help demystify some of the misconceptions about on-farm results' transferability to farmers' conditions, about farmers' conservatism, ignorance and resistance to new technologies (Nassif et al., 2003a).

Underlying in situ and PPB approaches was the strong belief that farmers, women and local populations in general have expertise and knowledge that had not yet been explored and valued by scientists. Not only did these communities conserve what works for them but they naturally and spontaneously have been able to contribute to the evolution of crops important to them. Most importantly, they were the main users of research results and varieties. Their needs, preferences and expectations must be considered and valued by scientists, namely breeders to increase the relevance of these results to farmers' conditions and the likelihood of their adoption and use. Furthermore, through participatory plant breeding farmers could contribute to accelerate the process of developing new material without loosing the whole diversity they seem to count on under prevailing harsh and risk prone environments. It was not surprising that both research experiences required intensive field work, commitment to working with farmers and local populations and the ability to listen to them and accept their views. Without these conditions, implementing participatory plant breeding and in situ conservation on-farm research would have be void of their founding principles and spirit. Interestingly, these research experiences provided scientists with opportunities to revisit their misconceived views of landraces and local cultivars and their blind trust in the transferability of on-station results to real conditions (Nassif et al., 2003a).

Over the years, sociology and the different biological and agricultural sciences have learned to work together and to capitalize on provided insights and information. Most importantly, all disciplines have learned to work with farmers and to allow farmers to become partners in

setting up the research agenda and actors in the technology development process. Currently, some biology researchers themselves have become strong defenders of participatory approaches and of the relevance and necessity of effectively and substantively working with farmers as prerequisites for developing appropriate technologies. Biological and agricultural researchers shave become interested and concerned with understanding farmers' socio-economic environment and farmers' preferences and constraints as evidenced in the participatory plant breeding and in situ conservation experiences. Moreover, many INRA - Settat scientists (breeders, entomologists, animal scientists, etc) have parts of their research programs carried out in effective collaboration with farmers. The most eloquent example is the Integrated Pest Management Program. Social and cultural variables such landholding and social structure, organization of family labor, farmers' practices and strategies are increasingly recognized and taken into account. Sociological investigations and insights on people's perceptions, preferences, local knowledge systems and roles in development are considered useful and relevant. These factors help explain the variation in production and differential impacts among communities, households and individuals. Most importantly, they are being integrated into agro-biological perspectives.

This evolution may be explained by the paradigm shift in global scientific research focus from production to people-centered research. Production focused research has shown its limits in most international agricultural research centers as well national research systems. It was learned that obtained results were of little relevance to poor and resource limited farmers who make up the majority of farmers in developing countries. This has resulted in the growing tendency to pay greater attention to farmers' real conditions, needs and preferences in planning and implementing research and development activities. From this perspective, the contributions of social sciences in general and sociology in particular have gained visibility and recognition. Therefore, biological and agricultural scientists have become convinced that people should come first. In agricultural research institutions, working with farmers is vital. As clearly stated by Chambers (1989:195) "For the stakes are high. Over a billion people are supported by the third agriculture. The challenge is to enable many of the poorer among them to secure better and more sustainable livelihoods from their complex, diverse and risk prone farming when normal agricultural has so largely failed". In parallel the evaluation of development projects of the 1970's and 1980's resulted in disappointment and criticism. Then, social scientists showed the way of correcting existing failures and biases. As indicated by Uphoff (1985:359)"Putting people first in development projects comes down to tailoring the design and implementation of projects to the needs and capabilities of people who are supposed to benefit from them". Undoubtedly, putting people first should start by adopting participatory approaches and building project design on appropriate socio-economic data as well as technical knowledge.

Using socio-economic information

Recognizing the necessity to consider farmers' conditions in applied agricultural research and technology development and the vital role that sociology could play in generating useful socioeconomic information, El Mourid, then head of INRA - Settat, stated in the foreword of

the baseline report the following:" This report attests to the will of dryland research to take into consideration farmers' conditions in setting the research agenda and technology development. This will has been materialized in the conception and the completion of the baseline study. The typology is one of the many possible uses of the baseline study which could improve our knowledge of farming systems and increase the efficiency of our efforts" (Moore et al., 1993). Indeed, as the report was developed, scientists from different disciplines were using particular data sets for their programs on soils, crops and cropping practices, livestock management, etc. Even the sociology team has used the baseline samples in subsequent studies and has built upon the baseline data in carrying out more elaborate studies using other techniques such as the division of labor which used time budget techniques (Nassif, 2001).

The sociological component of in situ conservation research was very instrumental in identifying collaborating communities and farmers on the basis of objective criteria and farmers' willingness to participate and share their experience. Socioeconomic information also provided insights for understanding farmers' rationality and conservation behavior. They were also useful in creating the opportunity to relatively grasp farmers' knowledge and practices. The generated information through focus group discussions with women in collaborating communities were vital in terms of changing existing misconception on women's contributions in agriculture, their knowledge of crops and varieties and their role in the conservation of crop genetic diversity. All that was possible because of the participatory nature of the adopted approach and the multidisciplinary character of the conception and implementation of the sociological work (Nassif, 2002; Nassif and Birouk, 2003).

The most significant role ever played by the sociology discipline in conjunction with biological disciplines was in the case of the participatory plant breeding experience. As noted earlier the whole approach was based on breeders, sociologists and farmers working truly together. The approach opened true dialog between scientists and farmers. Generated information on farmers' selection criteria and farmers' selected lines were not discarded or simply recorded in reports. On the contrary, that information and selected lines were reintroduced during the following agricultural season to advance in the selection process.

Lessons learned

Several lessons have been learned from reviewed experiences. Given the stated objectives of the baseline study (identification and categorization of existing farming systems in the region and the provision of a benchmark of useful and accessible information to inform ongoing technology research and transfer), survey methods were the best means to generate such a diverse, descriptive, comprehensive and predominately quantitative data set. Sociologists took the lead in the conception and implementation of the baseline study. In looking back at the experience, learned lessons include the following. First, the development and the transfer of technologies appropriate to the arid and semi-arid (aridoculture) regions of Morocco required a basic understanding of farm households and the farming systems which sustained them. The baseline data set and developed farming systems typology provided

the basis for that understanding (Moore, 1993). Second, socioeconomic data are important to other disciplines. But these information were not easily used or accepted by biological and agricultural scientists unless they were expressed in quantitative terms. That is why surveys are preferred because they could generate information other biological and agricultural research programs could use to streamline their specific activities. Third, in addition to researchers, extension workers as well as policy makers could use socioeconomic data for planning and implementing their technology development and transfer programs. In fact, the available baseline study report provided a core for the systematic integration of information on farm households and their productive activities. It also contributed as a decision making tool for the development, research, targeting, evaluation, and dissemination of agricultural innovations (Moore, 1993).

The first phase of Morocco's component of the in situ on-farm conservation project (1998-2001) has been an important learning experience for all participants, farmers, scientists, development workers, NGO members, and many others. Learned lessons from the in situ conservation research experience were manifold. The first lesson pointed to the empirically grounded basis for farmers' use and maintenance of crop landraces. Farmers maintained available crop landraces because of their high adaptation to predominant natural and socioeconomic conditions. The second lesson concerned the complex nature of in situ conservation of agricultural biodiversity. The third lesson indicated the necessity of participatory approaches and strong multidisciplinary teams in this type of research. Approaches to the study of in situ conservation on-farm need to be participatory and gender based. Farmers and women's contributions would not have been understood nor clearly recognized using conventional approaches and methodologies. Women's responsibility for livestock, grain storage, processing and food preparation result in their substantial involvement and use of agricultural crops. A wide array of disciplines and specialties are needed to design and implement integrated research programs on conservation and sustainable use of plant genetic resources. Otherwise, less effective deterministic and reductionistic analyses are likely. The fourth lesson pertained to the correspondence between women and farmers' knowledge systems and experiment based results (Nassif and Birouk, 2003).

Learned lessons from the participatory plant breeding experience are also manifold. First, contrary to preconceived ideas about farmers' ignorance and inability to make meaningful choices among large nurseries, the PPB research with farmers showed that farmers were more than capable of making visual selection of best lines. In spite of the high variability among farmers in terms of the number of selected lines within any particular nursery (from less than 10% to more than 50% of observed lines), farmers' visual selection was often closer to that of the national breeder. Moreover, farmers' selected lines especially those indicated as best lines had high straw and grain yields. Farmers and women ability to make selections among hundred of lines was also noted by Ceccarelli et al., (2000) in the case of barley and Sthapit and Joshi in the case of high altitude rice in Nepal (1998).

The second lesson pointed the importance of straw to farmers. It is important to remember that most Moroccan farmers raise livestock on their farms and straw is central to their feeding strategy. During wet years, farmers collect as much straw as possible and store it. During dry years which have become more and more frequent in Morocco, farmers become

more preoccupied with straw availability, quality and price than with grain. In fact, during the last successive dry years, barley straw was marketed at equal or higher prices than barley grain such as was the case during the January -April period of 2001 (Nassif et al., 2003).

The third lesson was that farmers' visual selection can be as efficient as yield testing at the experimental stations with the advantages of selecting for targeted environments and responding to farmers concerns. The ranking of lines at experimental stations generally benefiting from optimal conditions and high inputs is different from that at farmers sites. This makes it necessary and essential to conduct this type of trials in different barley growing areas. This also means that the selection at farmers sites is the most appropriate way to search for and develop barley varieties that are adapted to farmer physical and socioeconomic environments. Such an approach will help speed up the process of developing new barley cultivars and their eventual use by farmers. Furthermore, assuring farmers' actual participation in the selection and incorporating farmers' preferences in barley variety development will eventually contribute to making the conventional transfer of technology unnecessary (Nassif et al., 2003).

Conclusions

The review clearly indicates a considerable evolution in the role of social science from simply assisting biology and agricultural research whenever needed or deemed useful to being a crucial component of integrated participatory research at INRA. It is argued that occurred evolution may be explained by the paradigm shift in global scientific research focus from production to people centered research.

A major conclusion of the in situ conservation work is the urgent need to pay attention to the policy dimension of in situ conservation research. Farmers' current use of landraces must be recognized and supported through policies, research and extension that are favorable to in situ conservation. It is necessary to develop the present initiative on in situ conservation of landraces into a more global perspective on the sustainable use and conservation of agricultural biodiversity in Morocco. Such a perspective needs to go beyond farmers to the government responsibility in preserving agricultural biodiversity for future generations.

Participatory plant breeding and in situ conservation research can play a key role in the conservation and sustainable use of Morocco's agro-biodiversity. This type of research may also contribute to giving farmers the place they deserve in society through recognition of their valuable knowledge and expertise. While both research approaches hold promising perspectives to overcome existing drawbacks and obstacles in barley production in Morocco, they are still not yet mainstreamed effectively into the INRA research strategy. This mainstreaming is not a luxury but a necessity for crop like barley and when research in conducted in fragile environments with specific population needs and conditions.

Participatory research in general needs not only good science but also long term institutional commitment and support. Participatory plant breeding and in situ conservation research require important accompanying measures such as the revision and adaptation of the variety registration criteria, the development of the informal seed sector, the recognition and support of farmers' rights.

In conclusion, reviewed experiences clearly point to the need for generating relevant socio-economic information and knowledge and the value of their integration into interdisciplinary research programs. These experiences also demonstrate that well thought of approaches and methods are crucial to obtaining results that can rapidly be used.

They also indicated the evolution that occurred in the role of social sciences, namely sociology, in agricultural research institutions.

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