Diversity of Frameworks for Understanding Agro-biodiversity Why seeds matter?

Keynote

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Abstract

Using the cases of genetic resources management involved by local farmer, meaning of seeds for farmers is discussed. Farmers recognize the value of seeds not only based on yield potential and profitability but also based on risk distribution and domestic use values. Hiroshima local gene bank activities to re-introduce obsolete varieties of vegetables back into the communities where genetic resources had been originally collected showed importance of collaboration among different stakeholders for effective seeds management for rural (re-)vitalization including formal research institutes and farmers. Participatory research in Burkina Faso showed the difficulty of understanding farmers' criteria for seeds and variety selection by outsiders including extension workers and researchers. Institutional building to facilitate collaboration among national and local level stakeholders is suggested for seed and food security of farmers especially in disadvantaged areas.

1. Introduction

Agro-biodiversity primarily consists of eco-system, inter-species diversity, and intra-species diversity. Within intra-species diversity, there are plant genetic resources, animal genetic resources, and micro organisms. In this short paper, however, plant genetic resources will be mainly dealt with. Importance of conservation and utilization of plant genetic resources is now widely recognized. Due to the rapid expansion of the human population and its activities, conservation of genetic resources is urgently needed. Soil, water, and genetic resources constitute the foundation upon which agriculture and world food security is based. Of these, the least understood and most

undervalued are plant genetic resources. They are also the resources most dependent upon our care and safeguarding. And they are perhaps the most threatened (FAO 1996). These resources are generally recognized as seeds by farmers since they perceive the values of genetic resources as input for cultivation. However, as explained in the following section, this important message is not widely recognized by researchers.

2. Understanding Agro-biodiversity

Among the people discussing how to conserve plant genetic resources, plant biologists have been the first and dominant in the scene. The great majority of the discussions have been, therefore, devoted to technical aspects of conservation and utilization. They hardly realize what senses of values they are influenced by, what sorts of institutions they belong to, and what are the standpoints of the people who digest their ideas (Mcpherson 1985). Yet scientists tend to believe that what they discuss is objective and implies only bare facts. Another problem may be a sense of the superiority of natural science to other areas of studies and indigenous knowledge of people (Rohrer 1986). This attitude will hardly help the practitioners to formulate or to appreciate the various viable institutional structures necessary for conservation and utilization of genetic resources in farmers' fields in developing countries.

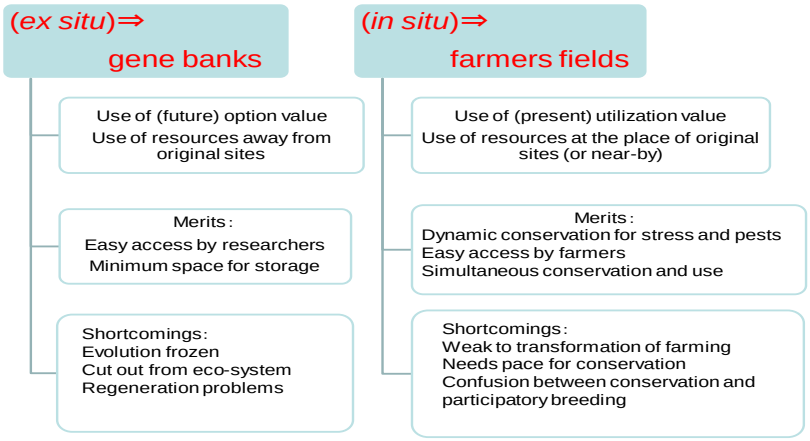

Fig.1 Where genetic resources are conserved and why

Economists may raise simple questions such as: what opportunities of advancement are foregone by allocating scarce resources for

conservation; and whose interests are being served by such conservation. Since economic advancement is a strong incentive for policy making and its implementation in development, people who support conservation work have been emphasizing the importance of genetic resources in economic terms. However, these approaches are only based on the market economy and are not totally applicable to actual situation in many developing countries (Richards 1985).

Sociologists and anthropologists will object to the idea of the superiority of so called modern technology and will also object to analyses fully dependent on the market economy. From their view points, if conservation is necessary, farmers' knowledge and existing systems are the place to start (Richards 1985). It has been revealed that there exist many different institutional forms for conservation associated with many different incentives (Nishikawa 1990). Economic value in terms of option value, which is future use value extracted from breeding work, has been the main incentive for traditional off-site conservation. When this value is too much emphasized, people tend to ignore farmers' own value concepts of direct use including social, cultural, and medicinal incentives.

In order to establish viable institutional arrangement to promote conservation work in line with sustainable development, especially in agriculturally less favorable areas, coordination and harmonization on various institutions and incentives are required. The incentives need to be based on diversity of value concepts, which are in many cases different from economic point of view.

In this short paper, importance of collaboration among different stakeholders and research and development based on farmers' own concept is explained using concrete cases from both in Japan and in Africa.

3. Hiroshima Agricultural Gene Bank

Hiroshima Agricultural Gene Bank was established in 1989 as a research foundation independent of government although infrastructure was constructed and donated by the prefecture government. From its start, the Gene Bank had an objective to serve for the promotion of local agriculture in order to compete with other nearby production areas. The Gene Bank emphasized the utilization of diversity of varieties both indigenous and introduced. Necessary technologies, again both traditional and advanced, were provided by local (governmental) experiment station. Although most of the samples have been introduced from outside of the region, Hiroshima

Gene Bank has made great efforts to collect traditional local varieties which are no more cultivated commercially and only used for family use and/or ritual use. 384 indigenous varieties were collected. These crops include vegetables (turnip, radish, and squash), beans, buckwheat, and miscellaneous grains.

3.1. Re-introducing local traditional cultivars

Hiroshima Gene Bank has been successfully re-introducing traditional local varieties including vegetables into the marginal area for regional development. This aims to develop new products for local consumption, which can be taken care of by elderly farmers and at the same time marketable.

This re-introduction program at Hiroshima is called 'seed loan'. It does not mean farmers are not able to afford to buy their seeds. Simply because these obsolete varieties are not available at market. Those farmers who obtained seeds from gene bank are expected to return the same amount of seed in the next year.

This system has a few unique characters to be successful. They are:

- strong commitment of the institute as a local gene bank to regional development. Primary objective of the gene bank is not the research activities within the institute but selection of new varieties for the region which will be adopted by local farmers;
- existence of infrastructure for genetic resources activities. Re-introduction is managed by the gene bank operated by an independent foundation, but infrastructure was originally constructed by government;
- close and functional links between gene bank and farmers. Farmers have access to gene bank for provision of seeds and technical information;
- involvement of extension officers. Exploration and collection of local varieties were made by retired extension officers who knew the details of traditional farming and had trusting relations with farmers. Re-introduction is processed through extension offices which are located close to farmers' place;
- innovation of products cooking methods. In order to promote marketing, cooking demonstration was organized by the gene bank with the help of local dietitians; and
- Finally, participation of local female farmers by their own initiative. Local old female farmers took initiative for re-introduction of vegetables hoping that it would be good produce for their morning open market nearby.

3.2. Provisional evaluation of the program

Local aspect

The most successful example of this re-introduction is local turnip called 'Ota Kabu Turnip' (*Brassica rapa* L.). Traditionally, people used this vegetable mainly for pickles and sometimes ate root as snack. Since Ota kabu turnip is almost wild type leafy vegetable, it does not need much care during its cultivation. It can survive under snow and provide precious food materials as the source of vitamins during winter. It does not need chemicals. Furthermore, farmers utilize the nature of traditional varieties which produce buds at scattered period. Farmers harvest small amount of buds every morning for a long duration during early spring. This means that labor is not too intensive for those old farmers and consumers can enjoy the produce for long time during early spring.

Global aspect

This initiative can also provide global genetic resources system with an alternative cycle of conservation and utilization of genetic resources, and this enables farmers in marginal area may equally share the benefits of formal genetic resource conservation system with other stakeholders such as breeders and commercial farmers.(Figure 2.)

3.3. Lessons learnt

Utilization of traditional varieties with some marketing value will be one of the most possible ways of effective conservation and utilization of local genetic resources. The example, although from different region, may be applicable in marginal agriculture in various regions in development and utilization of new incentives for local genetic resources. I hope this case continues to show a success, both in conservation of local varieties and in income generation for small scale farmers.

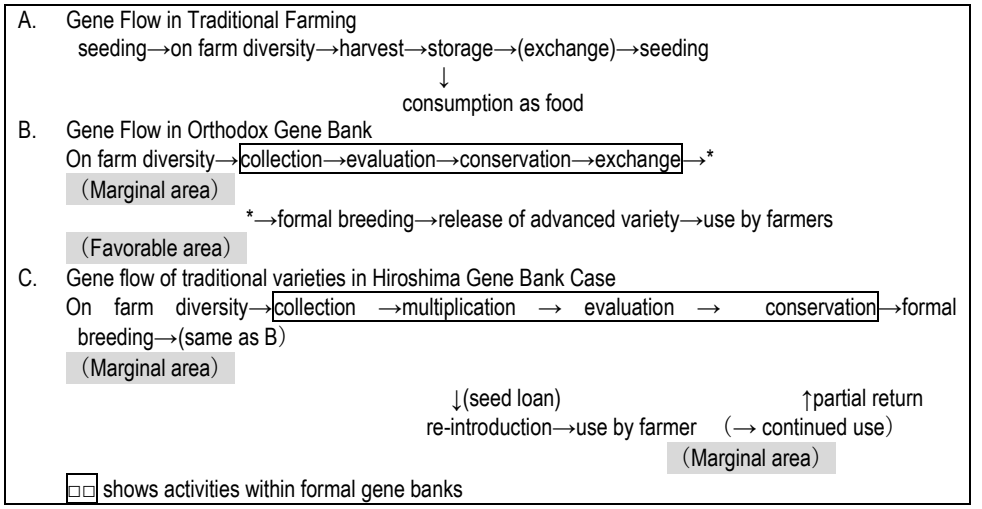

Figure 2. Conceptual Sketch of an Alternative Cycle of Conservation and Utilization of Genetic Diversity of Traditional Crops

Modified from Almekinders(2001) and Iwanaga et al (2000)

4. Mother-Baby Trials as Participatory Learning and Action-Oriented Research in Burkina Faso

Mother-baby trials were conducted in Burkina Faso, where rapid introduction of improved varieties are promoted by government after enactment of new seed law, with interview survey for farmers on perception of their criteria to evaluate varieties.

4-1. Preliminary surveys

Two villages, one with long experience of participatory research with Research Organization (referred as INERA village), and one with non experience (referred as Non-INERA village) respectively in three different agro-ecological regions were chosen.

From the preliminary study, different functions of traditional varieties were expressed by many farmers. Although there was no significant difference found between two villages in each region in terms of perception on criteria on varieties, some information was obtained that villages with experiences working with INERA has more positive acceptance of improved varieties. Also, it has been found that influences of extension activities to farmers by technicians in baby trials may have changed their behavior.

From the interview with technicians, it has also been found that 'dissemination of knowledge' approach is common as an attitude of technicians rather than communication to extract farmers' knowledge. Simultaneously, farmers are also inclined to accept external input rather than carrying our trials and errors when external projects were introduced.

4-2. Summary of participatory research

However, more detailed investigation revealed that different farmers groups have also different preferences. Farmers in INERA village who have also been exposed our experiments for more than one year has more variable selections including both Improved Varieties (IVs) and Local Varieties (LVs). Within LVs, different varieties were chosen by farmers of different villages although these villages are located nearby each other. Earliness and productivities are most frequent answers for selection; other traits such as tastes, tolerance to wet weather, applicability for mixed cropping were also reported. Farmers with more information might have tendency of choosing more varieties. If shown IVs with fertilizer application, farmers with less experiences of intervention from technicians tended to choose IVs.

Importance of managing more than one variety was also recognized. For IVs, necessity of irrigation and other input including fertilizer were also recognized and farmers chose these varieties on condition that such input are available.

Most of the participating farmers answered that improved varieties are better than traditional varieties, which may have been due to the instruction of technicians involved. Triangulation by group workshop has suggested this bias; therefore, further methods need to be established to mitigate the influence of such guidance from technicians on perception of improved and traditional varieties by farmers. The more farmers are exposed to formal extension systems and development projects, the deeper they tend to depend on external input. Integration of farmers' own practices and introduced input and technologies is critical to manage agro-biodiversity existing in the villages effectively. If farmers are influenced by external actors for direction, different intervention may lead more participatory approach.

4.3 Lessons learnt and further research

In many developing countries, agricultural and rural development has been implemented through introduction of Improved Varieties (IVs). In Burkina Faso, Ministry of Agriculture has a clear policy of introducing certified seeds of IVs through market mechanism especially after recent enactment of new seed law. However, problems such as non availability of suitable varieties for farmers and enough seeds in time are found commonly. One way of solving these problems is to establish a formal seed provision system of IVs from basic seeds to multiplication and marketing. Another way is to improve the existing system of seed provision and procurement within rural communities including Local Varieties (LVs). For both ways, it is necessary to understand the farmers' perception of crop varieties and seed security.

In this research, the authors try to find farmers' perception of criteria for preferences among varieties and distinguishing varieties including both Improved and Local Varieties.

In order to capture and integrate farmers strategies for variety management into crop improvement and extension, visits to crop fields by researchers at different stages of crop growth are prerequisite. Compared with interview methods during dry season, workshop with Mother-baby trials at fields may bring more precise information of farmers' reality. However, considering the resource scarcity, efficient methods need to be developed.

Table 1 Examples of farmers' statements for selection criteria

Var	F/G	#	Statements
A4	VI	P16	It has a better productivity but requires treatment. Its cycle is early but longer than L3. The pods are large and the grains more provided than in L3. It is better for fodder. (6)
		P18	Produces three times in addition to its sweetened taste. It has a better productivity if ever it is treated. It needs pumping to produce well. (8)
L1	III	P14	Good productivity with long pods. The stem is drawn up with the result that the pods do not rot whatever the rain that falls. The grains are solid and easy to cook. It is a short cycle variety. The productivity which is concrete influenced the change of choice this time.(7)
		P15	Better productivity, short-cycle, and good taste. It does not need seasoning for consumption. The grains are small but very dense. I prefer it for the next production in addition to other varieties. A producer should not be satisfied with only one variety even if it is better.(10)
L3	VI	P14	It is a much known traditional variety with the best productivity. Only she does not like the soils soaked with water because it produces less and rots at this moment. (9)
		P19	It is a traditional variety and can be mixed with the sorghum. Its leaves are edible and are a good fodder It has the best productivity but its cycle is average.(8)

Notes: Var= variety number, F/G= farmer group number, #= farmer number.

5. Participatory Seed Management and Distribution within Global Context

From the above two cases, we may be able to learn the importance of participation of local stakeholders as well as outside stakeholders such as national and international research organizations. However, actual collaboration among such different stakeholders is quite difficult to realize. Framework such as International Treaty for Plant Genetic Resources for Food and Agriculture will have functions of facilitating such collaboration using both monetary and non-monetary distribution of benefit derived from sustainable and participatory management of local genetic resources. By this way, genetic resources can be effectively utilized both in the areas where industrialized agriculture is implemented usually far from the origin of such resources and in the areas where those resources were originally maintained. Figure 4 shows this idea in schematic manner. In order for this framework to work, attitude of extension and research staff both in government and non-government sectors towards farmers is critical. Leaning from farmers is a starting point for any activity concerning sustainable management.

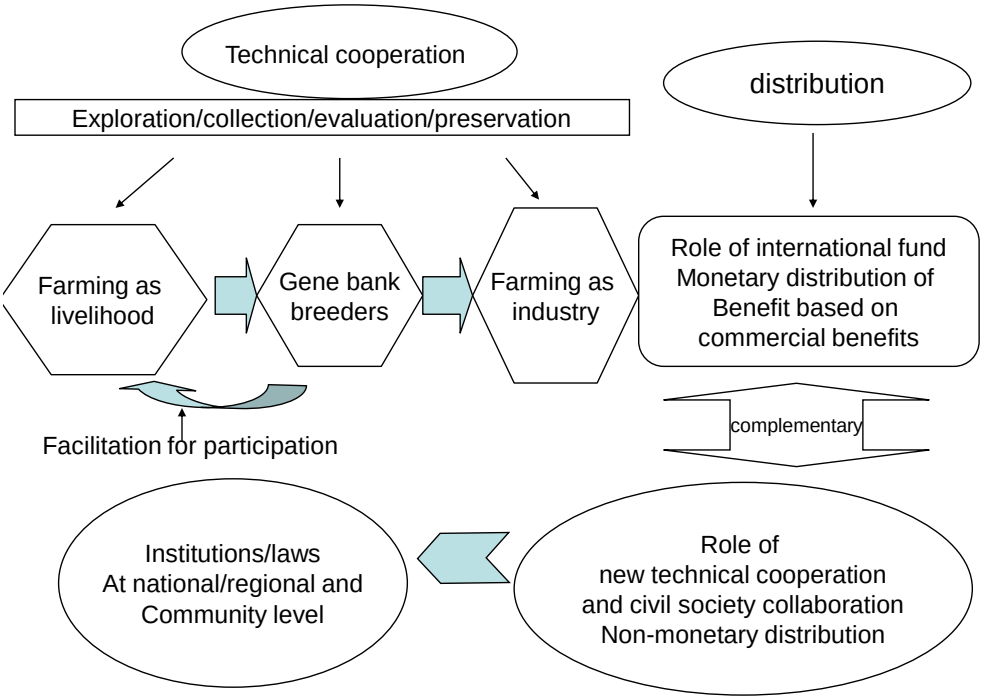

Fig.4 Possibility of participatory seed development and production within global system

6. Conclusion

Two cases revealed that there is diversity of frameworks to understand the importance of agro-diversity, especially crop varieties, by farmers. History of genetic resources study showed that the most important stakeholders in management were not considered thoroughly in the argument.

Based on this background and lessons learned from two cases, rather fundamental questions to be asked are why governments in developing countries are inclined to introduce formal system of production and distribution of certified seeds although scientific data supporting the merits of this approach have not been established yet. Socio-economic findings clearly suggest the high capacity of farmers on maintenance of genetic integrity, thus improvement of systems based on farmer harvested seeds in local areas need to be enhanced for sustainable agro-biodiversity management for development.

Further international collaboration is suggested in the area of research-extension synergy especially through integrating learning process of researchers and extension workers from farmers. Together with conventional international cooperation on improved varieties and industrialized agriculture, this alternative approach will enable agriculture in developing counties such as Ethiopia more diverse and give farmers more opportunities for endogenous development by farmers themselves.

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