SPGRC Network News

A Publication of the SADC Plant Genetic Resources Network

JULY - DECEMBER 2006

SPGRC Director Resigns

The former Director of SPGRC, Dr Bonga S. Nkosi who joined SPGRC in June 2006 tendered his premature retirement from SPGRC due to medical reasons and officially vacated the office on 31st August 2006. Dr Nkosi has since gone back to his previous employment as a Senior Lecturer at the University of Swaziland under the Faculty of Science, Department of Biological Sciences. Ms Thandie J Lupupa was appointed to act in his position from 1st September 2006.

Board Members Appointed to Higher Government Positions

Two SPGRC Board Members have been appointed to higher government positions in their respective countries.

The Board Chairperson who is also the Chairperson of the Zimbabwean NPGRCom, Dr Shadrack Mlambo has been appointed to become a Permanent Secretary in the Ministry of Agriculture and Cooperatives in Zimbabwe.

At the same time, Dr Mohammed M Msabaha who is also a Chairperson for the Tanzanian NPGRCom has been appointed to become the Assistant Director for Crop Research in the Ministry of Agriculture, Food Security and Cooperatives.

The SPGRC Network is very proud of their appointments and wish them brilliant successes in their work.

Contents

SPGRC Board Meets in Lusaka and Pretoria

23rd SPGRC Board meeting in Lusaka

The 23rd SPGRC Board comprising of chairpersons of the National Plant Genetic Resources Committee was held at SPGRC, Lusaka, Zambia between 04 and 06 October 2006. Mr. Richard M. Chizyuka, the Permanent Secretary *cum* Minister for the Ministry of Agriculture and Cooperatives, officially opened it.

Though it was earlier scheduled to be held in Gaborone, Botswana, the Board unanimously decided to instead, meet at SPGRC in Lusaka in order to be able to meet and interact with the newly recruited Director and three regional staff

During the meeting, the Director of FANR at the SADC Secretariat, Mrs Margaret Nyirenda visited the genebank at SPGRC

The Board whose composition had not changed much except for Mr Yacoob Mungroo from Mauritius and Ms Zodwa Mamba from Swaziland who joined, dwelt on among other issues, the finalisation of Memoranda of Understanding between IPGRI and SPGRC, and of SPGRC establishment, as well as finalisation of the SPGRC Long-Term Sustainability Strategy that will have to be re-submitted to the Integrated Committee of Ministers later in 2007. In its deliberations, the Board instructed SPGRC management to visit DR Congo in order to establish modalities and grounds for starting PGR activities in the country.

SPGRC CALENDAR OF EVENTS, 2006

SPGRC/NPGRCs Annual Technical Review and Planning Meeting: 28th August - 1st September 2006, Lusaka, Zambia.

Ordinary 23rd Board Meeting 4 - 6 October 2006, Lusaka, Zambia

Nordic Genebank (NGB) Plant Genetic Resources Training Course: 19 June - 07 August 2006, Sweden

SADC Seed Security Network Steering Committee meeting at SPGRC, 8 December 2006.

Annual Technical Review and Planning Meeting, Lusaka, Zambia

The 2006 SPGRC Annual Technical Review and Planning meeting took place at the Hotel Intercontinental in Lusaka, Zambia between 28th August and 1st September 2006. The meeting brought together curators, technical staff from all the National Plant Genetic Resources Centres (NPGRCs) in the SPGRC network, as well as the International Development Partners who have vested interest in the network.

Presentations were made to reflect work done by National Plant Genetic Resource Centres across the SADC region

It was reported that the contracts for the three Senior Programme Officers, Mr Charles Nkhoma, Mr Brian Chirwa and Mr Godfrey Mwila expired on 30th June 2006 and following finalisation of staff recruitments done by SADC Secretariat the posts were filled by Ms. Thandie J. Lupupa, Mr Barnabas W. Kapange, and Mr Lerotholi L. Qhobela respectively.

The meeting in session: Participants reviewed technical activities implemented in 2005/06 and discussed and approved proposed technical plans for 2006/07

The meeting was briefed on: completion of the external review of SPGRC whose outcomes were to be determined within 2006; submission of the SPGRC Long-Term Sustainability Strategy to the Integrated Committee of Ministers (ICM); submission of conservation strategy to the Global Crop Diversity Trust which has so far yielded support in some conservation areas; and collaboration with IPGRI whereby its staff visited SPGRC in July 2006.

At the meeting, the SPGRC Project Technical Advisor, Dr Moneim Fatih introduced participants to basic principles for maintenance of driers, in particular, its sensitive component, the "dehumidifier"

SSSN Steering Committee Meeting Held at SPGRC

On behalf of the SPGRC Acting Director, Mr B. Kapange (SPM – Documentation & Information) attended a Steering Committee meeting for the SADC Seed Security Network (SSSN) held on 8th December 2006 at SPGRC in Lusaka, Zambia.

The Steering Committee discussed the network progress reports and approved proposed workplans and budget for 2007. The Committee was also presented with the financial and audit reports, highlights on harmonization of seed regulations and the sustainability of the network. They also discussed and agreed on the composition of the Steering Committee.

Farewell to Outgoing Staff

Following the ending of contracts of the three Senior Programme Managers at SPGRC, cognisant and appreciative of their contribution to the network, the SPGRC Management and staff, together with representatives of NPGRCs organised a farewell party for the outgoing staff on 1st September 2006 at the Cresta GolfView Hotel in Lusaka, Zambia.

At the function, the SPGRC Board Member from Zambia who is also the Vice-Chair of the Board, Dr S W Muliokela presented the three each with a copper-coated plaque symbolising their positions and years of service.

Mr Nkhoma, former Acting Director takes floor to dance with wife

Morphological Characterisation of Locally Adapted Common Bean (*Phaseolus vulgaris* L.) Accessions from South Africa

Introduction

The common bean (*Phaseolus vulgaris* L.) with origins in Central America is an important source of protein and supplement the carbohydrate staple foods of maize and other cereals. Many small scale farmers are adding beans to their diversified landraces of cowpeas and bambara nuts. Established in 1995, the South African NPGRC has to date conducted 22 collection trips during which 448 *Phaseolus vulgaris* accessions were collected (Table 1). In order to identify existing gaps in the NPGRC collection as well as to increase the usefulness of accessions, the NPGRC attempts to characterize all accessions during multiplication exercises to increase usually smaller quantities of seeds collected from small scale farmers.

Table 1: Accessions per Province

Province	Accessions
Limpopo	8
Mpumalanga	9
Kwazulu-Natal	209
Eastern Cape	206
Free State	16
Total	448

Materials and Methods

During the 2003-2004 planting season, 284 accessions of the South African NPGRC common bean collection were planted in Potchefstroom. Accessions were planted randomly in two rows per accession. Each 5m row contained 60 plants with 7.5cm in row spacing and 75cm between row spacing. Planting was done with a precision plot planter.

Fertilizer NPK (3:2:1) at 100Kg/Ha was applied. Morphological characterization using the IPGRI descriptors was done in the field (vegetative and flower) and back at the NPGRC (pod and seed characters) after which were hand harvested and cleaned. Captured data was analysed in MS-Excel and a dissimilarity matrix using the method as described in Cole-Rodgers et al. (1997), compiled in Excel for use in cluster analysis using NTSys-pc software. Only 250 accessions were used for cluster analysis because of limitations in the Excel spreadsheet and only 10 characters were used to contribute towards the dissimilarity matrix for simplification. These were: Plant – Height and Type; Pod – Length, Width, Pods per plant, locules/pod; Leaf length; Seed – Pattern, Darker Colour, 100 seed weight.

Vegetative characters used include: Qualitative – plant type and leaf shape; Quantitative – plant height, leaf length, node number to 1st inflorescence.

Quantitative characters for inflorescence and pod include Racemes per plant, pod length and width, pods per plant, pod beak length and locules per pod; whereas, qualitative characters for the same include colour of standard, colour of wings, pod colour, pod suture string, pod curvature, pod beak position, pod beak orientation and pod wall fibre.

Qualitative seed characters recorded were seed coat pattern, seed darker colour, seed lighter colour, seed brilliance, seed shape; whereas, quantitative characters were seed per pod and 100 seed weight.

Results and Discussion

Qualitative Characters

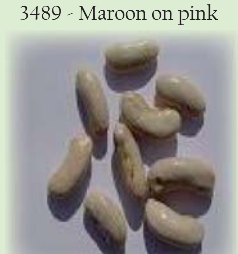
Plant type ranged mostly from determinate bush – 1 (48%), indeterminate – 2 (32%) and indeterminate – 3 (17%). The plant types indeterminate bush with erect branches – 4, indeterminate bush with prostrate branches – 5 and indeterminate – 6 were scarce.

Leaf shape were dominated by quadrangular – 2 (95%) and to a far lesser extent, triangular – 1 (4%). Round – 3 and Acute – 4 were represented by two accessions each.

Standard Colour were dominated by lilac – 3 (58%), Purple – 9 (14%), Green – 2 (13%) and White – 1 (10%). White with lilac – 4 was represented by 6 accessions and white with red stripes – 5 was represented by a single accession. Dark lilac with purple edge – 6 occurred in two accessions, whilst dark lilac with purplish spots – 7 occurred in 4 accessions. Wing colour ranged mostly from lilac – 3 (61%), white – 1 (26%) and purple – 8 (12%).

3489 - Maroon on pink

2098 - Green to olive



3717 - Pale cream to buff (kidney)

3671 - Yellow to greenish

Most accessions had few pod strings (81%), 7% were stringless and 12% had moderate stringiness. Half of all accessions had slightly curved pods, 28% were curved and 22% were straight. Three accessions contained recurving pods.

Beak position on all pods was equally distributed between marginal (50%) and non-marginal (50%). Most accessions had beaks that were either pointing upward (52%) or were straight (43%). Only 5% had beaks pointing downwards.

Most accessions had either leathery pods – 5 (48%) or moderately shattering – 6 (49%). Extensive shattering - 7 occurred in 2% of pods whilst only 4 accessions contained pods that were more contracting.

Just over half of the accessions had no seed pattern – 0 (52%). Rhomboid spotted – 3 (23%) and striped – 2 (21%) patters were most common, speckled – 4 (2%) and broad striped – 7 (2%) were uncommon. Scarce patterns included constant mottled – 1, circular mottling – 5, marginal colour pattern – 6, bicolor – 8 and spotted bicolor – 9.

Seed darker colour were dominated by maroon – 3 (22%), yellow to greenish – 5 (18%), brown pale to dark – 2 (16%), purple – 14 (14%) and black – 1 (9%). Less common were grey brownish to greenish – 4 (5%), pure white – 7 (5%), pale cream to buff – 6 (4%) and green to olive – 11 (4%). Very scarce seed darker colours were pink – 13, whitish – 8, red – 12 and other – 15.

3459 - Whitish

3702 - Maroon (Light)

3320 - Black on pale cream to buff

3388 - Yellow

Table 3: Mean, Range and Variance for Quantitative Characters

Character	Mean	Range	Variance
Plant height, cm	34.8	13 (3552) - 68 (2156)	56.1
Leaflet length, cm	9.3	3.4 (2437) - 15.2 (2883)	3.5
No. of nodes to 1st inflorescence	4.9	1 (3688, 3648) - 11 (2706)	2.1
No. of racemes per plant	11.5	2 (3182) - 48 (2075)	35.3
Pod length, cm	10.9	6.5 (2722) - 18.2 (1499)	2.5
Pod width, cm	9.4	6 (2706) - 15 (2440)	2.2
No. of pods per plant	27.7	2 (3677) - 310 (2212)	629.4
Pod beak length, mm	8.3	2 (2797) - 20 (2420)	8.5
No. of locules per pod	5.7	2 (3007) - 9 (2196, 2611, 2881, 3434, 3436, 3684)	1.1
No. of seeds per pod	5.5	2 (2184, 3007, 3018) - 9 (2196, 3434, 3436, 3684)	1.2
100 seed weight, g	29.7	10.2 (1459) - 54.6 (2420)	80.2

Seed lighter colour is very much dominated by pink – 13 (69%). Other more common lighter colours include pale cream to buff – 6 (13%), brown, pale to dark – 2 (6%), yellow to greenish yellow – 5 (3%) and red – 12 (3%). Exceptional seed coat lighter colours include maroon – 3 (acc 3686), grey brownish to greenish – 4, pure white – 7, whitish – 8, other – 15 and purple – 14.

Most accessions contained seeds that were shiny (52%) to medium shiny (37%). Only 11% of seeds were matt. Almost half of all accessions had cuboid – 3 (46%) seeds, 24% were oval – 2, 16% were kidney – 4 and 12% were truncate – 5. Very few accessions had round seeds.

Quantitative Characters

The mean, range and variance for the scored morphological traits are given in Table 3. Accessions at the minimum and maximum ends of the range are indicated in brackets. Only four of the quantitative traits displayed high variance indicating that a high variation exists in the collection for these characters. Plant height, number of racemes per plant, number of pods per plant and 100 seed weight displayed very high variances.

Cluster Analysis

The accessions scored were grouped into 22 distinct clusters at approximately 50% dissimilarity (Figure 1). The fact that there were some mixed accessions as collected from small scale farmers complicated clustering. Cluster membership is shown in Table 4. Accessions split into two large groups based on plant type, which is closely linked to plant height, leaf length and 100 seed weight – determinate plants being shorter, with longer leaves and larger seeds. Subsequent clustering was because of the presence or absence of a seed pattern and then seed darker colour. From Table 4 it is clear that certain groups are still underrepresented in the collection. Other larger groups further contain high numbers of accessions that differ with less than 5% from one another, which supports the possible formation of core collections within such groups.

Conclusion

From this characterisation work it is clear that certain provinces are under collected – further collections of common bean need to be conducted in Limpopo, Mpumalanga and Free State and concentrating on scarce characteristics as identified in the results section. Attention should also be paid to under-represented character groups such as long pod length (Group 6), determinate plants with broad striped seeds (Group 8), indeterminate bush with erect branches and no seed pattern (Group 9), determinate plants with pure white seeds (Group 10), indeterminate bush with erect branches and rhomboid spotted seeds (Group 11), Indeterminate plants with aggressive climbing and black seeds (Group 14), indeterminate plants with moderate climbing with speckled or broad striped seeds (Group 15), indeterminate plants with erect branches and striped seeds (Group 16) and indeterminate plants with aggressive climbing ability and broad striped seeds (Group 19). Accessions should further be evaluated for commercially important diseases such as mosaic virus etc. Core collection development for Groups 2, 3, 4 and 20 should be considered.

Acknowledgements

The author wishes to thank Dr. A. Liebenberg and Me. H. Heenop for their inputs into growing and harvesting the crop at the ARC Grain Crops Institute and NPGRC staff members for data capturing.

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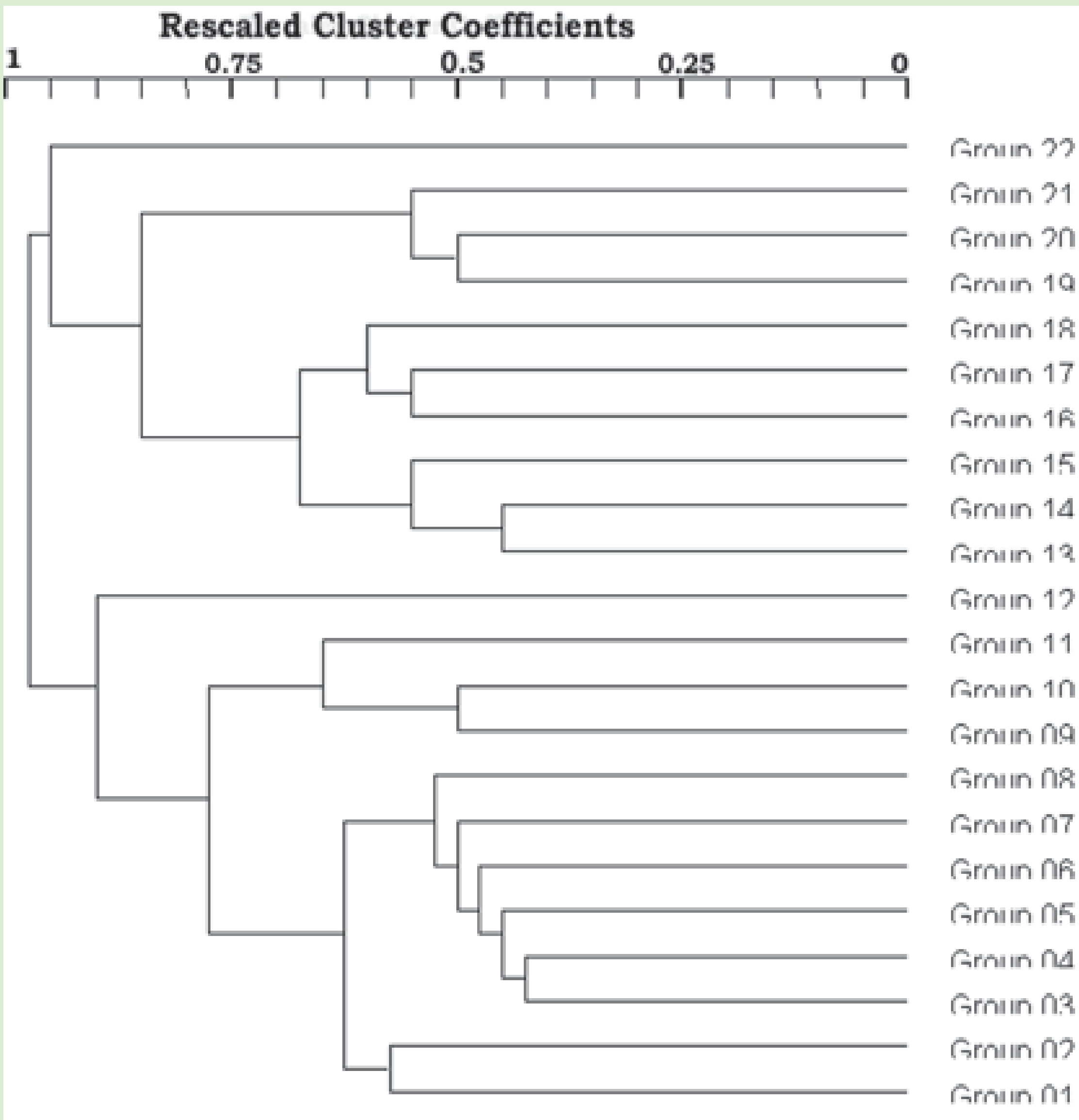

Figure 1: Cluster Coefficients

Table 4: Cluster Membership

Cluster	Cluster ID	List of Accessions	Acc with <5% Diff
1	Determinate/few indeterminate mixed, no seed pattern	2109, 2182, 2146, 2159, 3677, 2100, 2855, 3715, 2892, 3808, 3671, 3689, 3745, 3657, 3651, 3463, 3600, 3675, 3658, 3667	2
2	Determinate, no seed pattern	2082, 2579, 3644, 3630, 2532, 2507, 2184, 2441, 2127, 2180, 2885, 3694, 2472, 2509, 2418, 3716, 3775, 3795, 3730, 2440, 3510, 3743, 3724, 3633, 2787, 3701, 3650, 2531, 3742, 2120, 2181, 3703, 2857, 2098, 3459, 3629, 2 2891, 3018	18
3	Determinate, striped seeds	1432, 3688, 3540, 3592, 3584, 3598, 3799, 3569, 3642, 3637, 3628, 3680, 3697, 3741, 3564, 3649, 3565, 3645, 3665, 3632, 3653, 3664, 3193, 3527, 3702	16
4	Determinate, rhomboid spotted seeds	2170, 2185, 2788, 3462, 3674, 2128, 2195, 3396, 3739, 3798, 2884, 3613, 2419, 2765, 3731, 3700, 3726, 3796, 3641, 3656, 2172, 3581, 2856, 2908	11
5	Determinate/few indeterminate mixed, mixed seed pattern	3813, 2118, 3547, 3489, 3612, 3627	0
6	Determinate, very long pods	2429, 2439, 3182	0
7	Determinate/few indeterminate mixed, rhomboid spotted seeds	3636, 3577, 3659, 3678, 3200, 2101, 2160, 3654, 3758, 3552	2
8	Determinate, broad striped seeds	2883	0
9	Indeterminate bush with erect branches, no seed pattern	1521, 3502, 3224	2
10	Determinate, no seed pattern, pure white	2075, 3490, 2119, 3648	0
11	Indeterminate with erect branches, rhomboid spotted seeds	2878	0
12	Mixed accessions	2854, 2147, 3725, 3717, 2420, 3553, 2510, 3201, 3723, 3005, 3257, 3714, 2929, 3288, 2970	0
13	Indeterminate with moderate climbing, pods distributed evenly, no seed pattern	2177, 2842, 2982, 3388, 3408, 2837, 3255, 3525, 3397, 2882, 3528, 2793, 3686, 3372, 2794, 3685, 2488, 2839, 2797, 2764, 2893, 3434, 2099, 3386, 2789, 2900, 2158, 2196, 2886, 2901, 2484, 2792, 3546, 2730, 3254	6
14	Indeterminate with aggressive climbing, pods mainly in upper parts, no seed pattern, black seeds	2175	0
15	Indeterminate with moderate climbing, pods distributed evenly, speckled seeds	2881, 2896, 3684	0
16	Determinate with erect branches, striped seeds	2198	0
17	Indeterminate with moderate climbing, pods distributed evenly, striped seeds	2812, 3001, 3256, 3683, 2156, 3526, 2214, 2968, 3491, 2706, 3501, 2661, 2909, 3668, 3676, 3175, 3181, 3198	3
18	Indeterminate with aggressive climbing, pods mainly in upper parts, no seed pattern, brown, very tall	2176	0
19	Indeterminate with aggressive climbing, pods mainly in upper parts, broad striped seeds	2471	0
20	Indeterminate with aggressive climbing, pods mainly in upper parts, no seed pattern, shorter plants	2477, 2487, 2969, 3363, 2610, 2626, 2938, 2976, 2838, 2479, 2796, 3420, 2613, 2621, 2693, 2977, 2485, 2967, 2731, 2732, 2745, 2942, 3293, 2669, 3387, 3488, 3176, 3282	23
21	Indeterminate with aggressive climbing, pods mainly in upper parts, rhomboid spotted seeds	2611, 2722, 2746, 2966, 2728, 3320, 3333, 3385, 3003, 3007, 2939	5
22	Mixed accessions	2697, 2729, 3002, 2212, 3655, 3669	0

Programme for the Development of Strategies for *In-situ* Conservation of PGRs in Semi-Arid Areas of Zimbabwe

By: C. Mujaju (Genebank of Zimbabwe)

Summary Preview

The Programme for the Development of Strategies for in situ conservation of plant genetic resources in semi-arid areas of Zimbabwe was carried out in Tsholotsho and Nyanga Districts during the period 1999 to September 2002. The project was a collaborative activity with IPGRI, FAO, IFAD, Genebank of Zimbabwe (representing AREX, the ex-DR&SS), the University of Zimbabwe, the Africa University, and NGOs.

In the semi-arid areas of Africa, the management of plant genetic resources constitutes a crucial element of farmers' livelihood strategies. The principal objective of the present research programme was to enhance farmers' natural, human, social and physical capital assets to improve livelihood strategies based on plant genetic resources. The programme focused on creating, transforming or strengthening community-based structures and processes that support these strategies. These new structures and processes are presented here as instrumentalities for implementation in the context of IFAD investment and development projects.

Response to Principal research Questions

The research carried out within the framework of the project, focused on four crops (sorghum, millet, cowpea, bambara nut) to respond to the four following questions:

Q1: How does the maintenance and use of diversity contribute to strengthening the livelihood strategies of disadvantaged socio-economic groups in desert-prone areas of Africa?

Participatory diagnostics of farmer management of plant genetic resources, supported by morphological characterization of these resources, demonstrated motivations for maintaining diversity that could be broadly categorized in the three following main natural resource management strategies:

- Risk management: variation in rainfall was the most frequently cited risk factor and different varieties perform well in different years.
- Optimisation of production factors: e.g., farmers frequently explain that they select different varieties to match differences in soil water regimes, even within the same field, and in spreading labour requirements.
- Diversity of uses: a diversity of crops plays an important role in maintaining a balanced diet, while varietal diversity relates to different culinary practices or other uses.

These strategies are all more important in marginal areas where limiting factors are more critical and more diverse, and where the costs of commercial transactions are high.

Q2. What are the changes that affect farmers' livelihood strategies relying on PGRs?

Farmers have regularly signalled the loss of long duration varieties due to a shortening of the rainy season, though other research results have only been partially able to confirm this observation. In Zimbabwe, the amount of rainfall and its distribution pattern appears to be changing threatening the future of sorghum cultivation in most marginal areas.

In some areas of Zimbabwe reduction in the number of varieties of sorghum identified by farmers as a result of the intensification of the cultivation of maize and cotton have observed. Although this phenomenon could well improve farmer livelihoods in the short term, it also risks making them more exposed to unfavourable socio-economic changes as has been observed in other countries. Changes have also been observed in cultural and food habits, e.g. abandonment of certain vitreous varieties of sorghum.

Q3. Faced with these changes, how are farmers managing on-farm genetic resources?

There exists a range of practices and systems for the sustainable conservation and utilization of genetic resources depending on the ethnic group and cultural specificity. This range of practices and systems can be grouped in two principal themes: selection, maintenance and management of the diversity; and seed storage.

- Farmers manage and maintain diversity in the form of varieties, selected according to preferred traits that are often reflected in the names used. Selection is often carried out in the field prior to harvest, influenced by inter- and intra-varietal flow and recombination of genes, favouring the maintenance of high levels of genetic variability in the agricultural systems;
- Farmers have developed a vast range of techniques to conserve their seed stocks including use of sealed containers and granaries dedicated exclusively to seed with the use of ash and plant extracts to improve storage life.

Q4. What are the possibilities, conditions, modalities and their advantages required to assist the capacity of farmers in the context of development projects?

The application of a method of participatory diagnostics developed by the programme provides leads for improving farmer practices.

More specifically, the purpose of the diagnostic is to provide farmers, development agents and researchers with:

Overview of the present and past state of PGRs in the community; understanding of the role of diversity in farmers' livelihood strategies; and appreciation of the ways in which it is managed, deployed and used. It also provides insight into its maintenance and circulation within, and in and out, of the community; and awareness of who is responsible for what.

Following the participatory diagnostics developed by the project, different modalities for intervention have been identified. These notably include seed diversity fairs, Farmer Field Fora (FFF) for PGRs, community genebanks and improved seed storage systems.

Farmer Field Fora (FFF), carried out at village level, reinforce the capacity of farmers to analyse and appreciate the different options and to take informed decisions.

With regard to genebanks and seed storage methods, improved techniques have been promoted through exchange among farmers and the introduction of new methods.

A community genebank is a facility to store seed, at the community level, for a period of one or more seasons in order to avoid problems of seed insecurity. It can include the conservation of small quantities of a diverse range of varieties (as in a genebank) as well as larger quantities, sufficient for distribution, of a smaller number of preferred varieties.

First Impacts of the Project

As a result of the implementation of the participative methodologies and instruments developed by the project, the project has been able to generate the human conditions and institutional partnerships to create synergy among farmers, researchers and development workers.

SPGRC Community Work: Computer Donation

As a gesture to its commitment and implementation of community work, in October 2006, the SADC Plant Genetic Resources Centre (SPGRC) donated four used desktop computers to a nearby school – Silverest Basic School in Chongwe District.

On behalf of the SPGRC Acting Director and Management, accompanied by the Technical Officer (Mr. Kennedy Hamudulu), the Senior Programme Manager – Documentation and Information (Mr. Barnabas Kapange) explained on the need for the school to catch up with ICTs in doing their work. He narrated the power of ICTs in keeping information and records, communications. Mr Kapange assured the SPGRC technical wing's willingness to provide technical and training support to the school anytime a need arises.

Mr Kapange handing over donated equipment

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