COLLECTING IN ZAMBIA

K.L. Mehra [1/]

During April/June 1981, the IBPGR, in cooperation with the Department of Agriculture and Water Development of Zambia, organized a crop collecting mission in the Southern, Western, Central, Copperbelt and Luapula provinces of Zambia. A previous IBPGR mission undertaken in 1980 had collected crop germplasm in the Eastern, Central and Northern provinces of Zambia.

The mission collected 2,088 samples comprising 478 cereals and millets, 458 legumes, 445 cucurbits, 143 oilseed crops, 85 okra as well as other types, from about 200 sampling sites including farmers' fields, threshing grounds, backyards, farm stores and village markets.

Natural vegetation along forest margins was also explored to collect wild Vigna, Solanum, Pennisetum and Sesamum. In general, most of the ecological zones and traditional (ash-cultures and hoe and plough cultures) agricultural systems were explored to assemble a wide range of genetic diversity of several crops and their closely related wild species.

Personnel

The mission comprised Dr. K.L. Mehra, Team Leader (IBPGR Consultant); Mr. George Mulega and Mr. Watson Mahle (both from Mount Makulu Research Station, as counterparts, one at a time, in alternate provinces) and Dr. Bernard Hantaba (Southern province), Mr. J.D. Patel (Western province), Mr. Md. Abdus Salam (Copperbelt province) and Mr. M. Mwanandimai (Luapula province), as respective provincial counterparts. Local District Agricultural Officers or their respective staff members accompanied the team in each district. Often the staff members from different camps within a district acted as local guides and language interpreters.

The main local government officials who helped in the planning were Miss R.K. Chungu (Chief, Mount Makulu Research Station, Chilanga, Zambia) and Provincial Agricultural Officers Messrs. P.L. Ngango (Lusaka), O. Kampamba (Central), Joel Chivwema (Southern), T.S. Mubita (Western), D.B. Kajimo (Copperbelt) and E.H.B. Sinyanswe (Luapula). The district agricultural officers also advised the team.

Sampling procedure

This mission was intended to explore the areas which were not covered in 1980 by the IBPGR/ICRISAT germplasm collecting mission in Zambia. The germplasm diversity was collected using the random sampling procedure wherever possible and permitted by the farmer, the fields were not far away from habitation and the crop was mature, otherwise a random sample was drawn from the threshing ground, farmers' stores and village markets. It was often difficult to apply theoretically desirable sampling strategies to collect germplasm from traditional subsistence peasant farming systems which use complex inter-cropping patterns in fragmented land holdings of varying sizes.

A summary of samples collected and the

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Table 1. Genetic resources collected in Zambia, 1981

Crops	Number of collections from different provinces						
	Luapula	Copperbelt	Western	Lusaka	Central	Southern	Total
Cereals & millets							
Rice	8	5	16				29
Maize	20	41	47	4	13	35	160
Sorghum	13	43	38	4	14	43	155
Finger millet	21	22	10		6	4	63
Pearl Millet	2	2	52	2		13	71
Grain & other legumes							
French bean	20	30	2	1	15	4	72
Cowpea	29	27	48	4	12	29	149
Groundnut	25	17	40	1	10	21	114
Bambara groundnut	19	12	26	1	3	12	73
Pigeonpea	9	5	4			1	19
Other legumes	12	9	4		1	5	31
Forage grasses							
Pennisetum sp.	11	17	9	1			38
Pennisetum purpureum	9	5	4				18
Vegetable crops							
Okra	22	26	7	1	2	27	85
Hibiscus sp.	37	15	49		1	8	110
Cucurbits	65	127	128	9	3	113	445
Solanum sp.	15	22				1	38
Cleome sp.	9	11	10			2	32
Amaranthus sp.	12	20	24		4	5	65
Chenopods	1					5	6
Oilseed crops							
Brassica sp.	1	23			1		25
Sunflower			6		5	9	20
Castor	5	6	22		3	7	43
Sesamum	10	21	19		2	3	55
Other crops							
Corchorus sp.	8	6	3			7	24
Others							
Chillies, forage legumes, tobacco, cotton, *Ocimum*, papaya etc.	39	46	49	1	3	10	148
	422	558	617	29	98	364	2,088

routes followed are presented in Table 1 and Fig. 1. Over 10,000 kilometres were covered.

Data on the variability within the different crops at each sampling site were recorded and the full details are available in the author's detailed report to the IBPGR secretariat and this is available on request.

Traditional agricultural systems

Three distinct agricultural systems are recognized in Zambia, viz: bush-fallow ash-cultures (Chitemene), transitional ash-cultures and hoe and plough cultures.

Distribution of crops and genetic diversity

Specific geographic areas having more diversity in specific crops occurred in the areas explored, the pattern of diversity being dependent on the agro-climatic conditions, the agricultural system practised, local human preference etc. Some specific morphotypes are grown in certain areas while in certain crops the morphotypes had a much wider geographic distribution. Some salient features are given below:

(a) In maize, mostly broad, white-grained types are preferred but in all provinces wide variation in the size of the cob, row number, grain size and shape were noticed. Sporadic occurrence of yellow flint types was observed in all provinces. The local landraces showed varying degrees of out-crossing with improved varieties/hybrids. Genetic erosion was severe. Although maize was grown in all the districts visited, more variability was observed in the Gwembe and Choma districts of the Southern province and Ndola rural district in the Copperbelt province.

(b) In sorghum, both grain/dual purpose or sweet stalk genotypes are grown. More variability occurred in certain pockets of the Southern, Western and Copperbelt provinces. Red grained sweet stalk type had a much wider distribution. The farmers' field populations varied in head size, maturity, grain weight, seed weight etc. In all provinces, mostly tall, late-maturing bicolor, durra and guinea types, with the sporadic occurrence of caudatum and broom corn were noticed. Often, one or more types occurred as mixtures in the farmers' field and even hybrids between certain types were observed.

(c) The populations of finger millet were more variable in the Luapula and Copperbelt areas and to some extent, in the Western province. These were mostly Afro-Asian types varying in maturity, finger number, grain colour/size etc. The early-maturing types were collected in the Ndola and Samfya districts.

(d) In pearl millet, maximum diversity was observed in the Western province and in some pockets of the Southern province. The populations from Sinazongwe, Monze, Kaoma and Kalabo districts were more variable than those from other provinces.

(e) In rice, the collections were made from the flood plains of the Zambesi river, the water-logged sites in the Kaoma district in the Western province, Kafue river system/ seasonal dambo sites, the western and southern side of Lake Bangweulu and the eastern side of Lake Mweru. Mostly, indica types occurred as mixtures in varying proportions of two to five varieties. Early maturing types were collected along the southern side of Lake Bangweulu.

(f) In French bean, the farmers' field populations had mixtures of several grain colour types. Rarely could a stand of a one-seed colour type be found. The variation was high in the Copperbelt and the Luapula provinces.

(g) In cowpea, variation was maximal in the Western province. Special small-seeded types occurred in the Luapula province. Wide variation was observed in several agro-morphological characters, mostly late-maturing, indeterminate types occurred. The populations in the Western province were

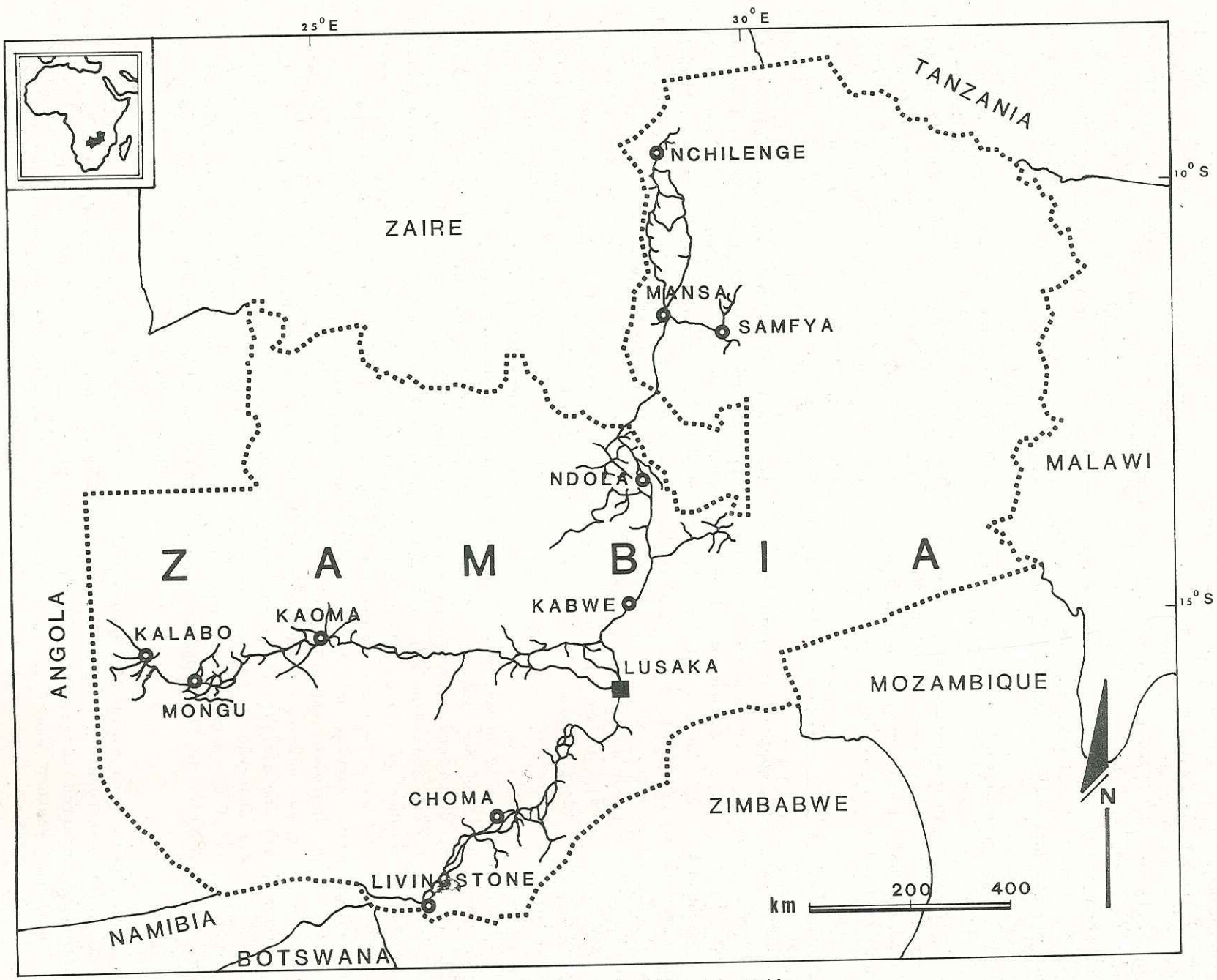

Fig. 1. Collection route followed in Zambia

more variable in several characters as compared to those from the other provinces.

(n) In groundnut, mostly bred varieties or their local derivatives were grown and not much variability was observed. The variability was higher in the Kalabo district as compared to other districts.

(i) A uniform distribution of variability was observed in Bambara groundnut. The extent of variation in seed colour was maximum in the samples from the Western province.

(j) Pigeonpea is grown as a backyard crop in Luapula and other provinces. Mostly perennial plants are grown as hedge plants and the grain used for home consumption.

(k) Among forage plants, Pennisetum purpureum exhibited much variation in the tiller number, leafiness and leaf size in the Luapula province, which had more variability compared to other provinces. Some pockets, showing more variability in the Pennisetum pedicellatum, occurred in the Luapula and Copperbelt.

(l) Wide variability in okra was observed in the Luapula, Copperbelt and Southern provinces. The genotypes were observed free from virus infection. In Luapula and the Copperbelt, both ridged and non-ridged types showed variability.

(m) In Hibiscus, different stages of domestication and evolution of the cultigens from the wild types could be observed, especially in the Western province. Spiny and less spiny types were observed. The populations in the Western province exhibited maximum diversity.

(n) Among cucurbits, pumpkin, gourds, sponge gourd etc., a high degree of diversity was observed in the Copperbelt, Western and Southern provinces. The morphotypes varied in different characters of fruit, i.e. size, shape, rind thickness, percentage of fleshy tissue etc. Cucumis species were highly variable and domesticated, semi-domesticated and wild plants showed rich diversity in the Western and Southern provinces. Some peculiar genotypes were collected from the Copperbelt and Luapula provinces.

(o) Castor exhibited maximum diversity in the Western province.

(p) In Sesamum, some pockets of the Copperbelt and Western provinces possessed genotypes with high capsule bearing and disease resistance.

Genetic erosion

Zambia has developed an excellent extension programme involving the provincial agricultural officers, district agricultural officers and camp workers. The new high-yielding varieties/hybrids of maize, sorghum, finger millet, pearl millet, groundnut, French bean, cowpea, rice, etc., have been recommended and farmers are gradually taking up the cultivation of new varieties/hybrids. The local germplasm of these crops is, thus, threatened, although at a much slower rate because traditional varieties continue to be cultivated in subsistence farming systems for home consumption. In recent years, more and more areas have been taken up for cultivation of cotton, sunflower, hybrid maize and to some extent, under newly released sorghum varieties/hybrids. The farmers are shifting the choice of their crops and the genetic resources are therefore threatened.

Processing of collections

The collections from each province were sun-dried and processed soon after the return to Lusaka. In the end the collections were divided into two sets, one for use in the Zambian programmes was handed over to Miss R.K. Chungu, Chief Agricultural Research Officer in Zambia, and the other set was brought to Rome for despatch to different research stations/institutes for conservation and evaluation.

Acknowledgements

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RESUME

Cet article décrit un second projet CIRP de collecte de plusieurs plantes entrepris en 1981 en collaboration avec le Département de l'agriculture et des eaux.

RESUMEN

En el documento se informa sobre un segundo proyecto del CIRF para la recolección de diversos cultivos en Zambia. Este se realizó en 1981 en cooperación con el Departamento de Fomento Agrícola e Hídrico de Zambia.

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All proposals should be submitted to the Board through its Secretariat, Plant Production and Protection Division, Food and Agriculture Organization of the United Nations, Via delle Terme di Caracalla, 00100 Rome, Italy.