

**Zambia National Plant Genetic Resources  
Programme**

**Wild Rice Germplasm Collection  
In Zambia**

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**Zambia National Plant Genetic Resources Centre  
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## ABSTRACT

The National Plant Genetic Resources Centre (NPGRC), undertook a wild rice germplasm collection mission in Eastern, Southern, Western, Luapula and Northern provinces between April and June, 1997. In Eastern province, the mission covered the Mfuwe area of Mambwe district. In Southern province, Monze, Pemba, Sinazongwe and Chisekesi districts were covered. The mission then moved to Western province where collecting was done in two areas of Sesheke district. The last stage of the collection was conducted in Northern and Luapula provinces, covering the districts of Mbala, Kaputa, Nchelenge and Samfya. A total number of 20 samples were collected consisting of 15 wild rice seed samples and herbarium specimens, 3 herbarium specimens of *Leersia* spp. and 2 seed samples of *Sorghastrum* spp. a wild sorghum. Most of the samples collected gave a low yield of seeds after threshing and cleaning. This was because most of the spikelets were empty and had no seed. Some populations of the wild rice were found to be at the flowering stage and therefore not much seed was gathered while other populations had shattered their seed which also resulted in small quantities of seed being collected. 4 samples had seeds weighing more than 50g while 11 had less than 50g of seed each. These may require immediate multiplication. The materials were to be distributed to IRRI, SADC Plant Genetic Resources Centre (SPGRC) and the NPGRC but due to inadequate seed amounts, only IRRI was provided with all the samples collected while SPGRC and NPGRC obtained samples only from those which had enough seed.

## **Introduction**

Rice genetic resources have been collected in the country before. In 1993, IRRI in collaboration with the NPGRC conducted a collection mission of wild rice which covered several parts of the country.

So far collections have been done from most parts of the country. The objective of the present mission was therefore to fill in the gaps that were left in the previous collections especially taxonomic gaps.

The areas which were targeted were Eastern, Southern, Western, Luapula and Northern provinces. The staff of the NPGRC and the University of Zambia (UNZA) were involved in the collection and the funding for the whole exercise was provided by IRRI.

## **Objective**

To collect wild rice germplasm in Eastern, Southern, Western, Luapula and Northern provinces.

## **Background and justification**

Rice, *Oryza sativa*, is an introduced crop to Zambia, but despite having been brought to this country some two centuries ago, it remained a small crop with villagers only cultivating small fields for a very long time. Only in recent years due to government efforts to promote cereals other than maize has production begun to increase. Even then the country is still far from self-sufficiency and relies mainly on import.

Activities of rice research in the country include the genetic improvement of the crop. The genetic improvement of cultivated rice like that of any other crop is dependent on the availability and utilization of a wide range of genetic resources including those of wild relatives.

It is therefore important that these genetic resources are collected and conserved in the genebank, to protect them from genetic erosion.

## **Target areas and target species**

The first collection was done in Mfuwe which is situated in the South Luangwa National Park in the Eastern province. Some collections were made inside the National Park while some were made in the Game Management Area. An interesting sample of *Sorghastrum* spp. a wild sorghum was collected in the Game Management Area.

In the Southern province, four districts namely Monze, Pemba, Sinazongwe and Chisekesi were covered. These areas were searched for *Leersia* spp. as the team was informed by the botanist from UNZA that *Leersia* species may be found occurring there. However after a thorough search for two days, no *Leersia* was found.

The team then proceeded to Sesheke in Western province where wild rice samples were collected from the Zambezi river.

The final part of the collection was in Northern and Luapula provinces. In Northern province, collections were done in Mbala where *Leersia* spp. was mainly targeted. The other area was in Kaputa district and the Mweru Wantipa National Park including the Game Management Area. Nchelenge and Samfya in the Luapula province were the last districts to be visited on this mission,

## **Planning and logistic arrangement**

Three organisations were involved in the mission namely IRRI, NPGRC and UNZA and their roles were funding, implementation and planning respectively. The collecting team comprised of the NPGRC collector, the botanist from UNZA and technicians from the NPGRC including the driver.

The mission was conducted in three stages and the teams were as follows:

### **Eastern province:**

M.M.Nawa - NPGRC collector  
Dr. P.S.Phiri - UNZA botanist  
B.Luwiika - NPGRC senior technician  
W.Ngoma - Driver

### **Southern and Western provinces:**

M.M.Nawa - NPGRC collector  
D.Nguni - NPGRC officer  
W.Ngoma - Driver

### **Northern and Luapula provinces:**

M.M.Nawa - NPGRC collector  
A.Shawa - NPGRC technician  
M.Chizangola - Driver

In all these areas, the District Agricultural Officer for the respective district was included in the team.

Permits were obtained for Mfuwe (Luangwa National Park) and Mweru Wantipa National Park. These were obtained from the Department of National Parks and Wildlife service.

In a number of occasions where the plants were growing in deep water, a canoe had to be hired to gain access to the areas. This was not a problem as most villagers were willing to hire out their canoes as long as they were paid something.

The main logistical problem encountered was in Sesheke in Western province where upon arrival from Livingstone, we found that the whole town had no fuel. Consequently, we had to travel back to Livingstone the next day to buy fuel for our trips.

Another problem that was encountered in Sesheke was the constant breakdown of the vehicle partly due to the bad state of the roads. The vehicle developed serious mechanical problems that a whole day was spent looking for spares and fixing it.

### **Scientific planning**

Dr.P.S.Phiri from UNZA was consulted during the planning phase. The herbaria at Mt. Makulu Research Station and the University of Zambia were visited to check on herbarium specimens when the ecogeographic survey was being conducted. Other references consulted include the manuals and handbooks on wild rice published by IRRI.

### **Sampling strategy**

Random sampling strategy was used to sample the populations of wild rice. At each site, more than five clusters were randomly selected. Then from each cluster, single panicles were obtained from 10 plants.

The number of plants varied greatly. In some cases it was higher while in others it was low. Every effort was made to collect as much seed as possible.

However for most populations, the number of empty spikelets was quite large and this reduced the final weight and quantities of seed tremendously upon cleaning as compared to the bulk material that was collected.

#### **Germplasm samples collected**

A total of 20 (twenty) samples were collected comprising of the following species:

<b>Collector's no.</b>	<b>Species</b>
NPL 001	<i>Oryza longistaminata</i>
NPL 002	<i>O.longistaminata</i>
NPL 003	<i>Sorghastrum</i> spp.
NPL 004	<i>O.barthii</i>
NPL 005	<i>O.barthii</i>
NPL 006	<i>Sorghastrum</i> spp.
NPL 007	<i>Leersia</i> spp.
NN 008	<i>O.longistaminata</i>
NN 009	<i>O.longistaminata</i>
NS 010	<i>O.brachyantha</i>
NS 011	<i>Leersia</i> spp.
NS 012	<i>O.longistaminata</i>
NS 013	<i>O.barthii</i>
NS 014	<i>O.brachyantha</i>
NS 015	<i>O.longistaminata</i>
NS 016	<i>O.brachyantha</i>
NS 017	<i>O.brachyantha</i>
NS 018	<i>O.brachyantha</i>
NS 019	<i>O.brachyantha</i>
NS 020	<i>Leersia</i> spp.

Below is a summary of the materials collected:

Species	Number of samples	Type of sample
<i>O. longistaminata</i> specimen	6	Seeds/Herbarium
<i>O. brachyantha</i> specimen	6	Seeds/Herbarium
<i>O. barthii</i> specimen	3	Seeds/Herbarium
<i>Leersia</i> spp.	3	Herbarium specimen
<i>Sorghastrum</i> spp.	2	Seeds
<b>Total</b>	<b>20</b>	

#### Distribution

The seed samples were distributed as follows:

Coll. no.	Species	Institution
NPL 001	<i>O. longistaminata</i>	IRRI
NPL 002	<i>O. barthii</i>	IRRI, SPGRC, NPGRC
NPL 003	<i>Sorghastrum</i> spp.	NPGRC
NPL 004	<i>O. barthii</i>	IRRI
NPL 005	<i>O. barthii</i>	IRRI, SPGRC, NPGRC
NPL 006	<i>Sorghastrum</i> spp.	NPGRC
NN 008	<i>O. longistaminata</i>	IRRI, SPGRC, NPGRC
NN 009	<i>O. longistaminata</i>	IRRI, SPGRC, NPGRC
NS 010	<i>O. brachyantha</i>	IRRI
NS 012	<i>O. longistaminata</i>	IRRI
NS 013	<i>O. barthii</i>	IRRI
NS 014	<i>O. brachyantha</i>	IRRI
NS 015	<i>O. longistaminata</i>	IRRI
NS 016	<i>O. brachyantha</i>	IRRI
NS 017	<i>O. brachyantha</i>	IRRI
NS 018	<i>O. brachyantha</i>	IRRI
NS 019	<i>O. brachyantha</i>	IRRI

The NPGRC and SPGRC obtained only four seed samples of wild rice as can be seen from the table above. This was due to inadequate amounts of seed obtained from the rest of the samples. Consequently we are requesting IRRI to assist us in

multiplying these samples as the NPGRC does not have the capacity to do so at the moment.

A set of four herbarium specimens was obtained at each site. These were distributed to IRRI, KEW, SPGRC and NPGRC.

#### **Conclusions and recommendations**

Wild rice populations have a wide range of flowering times in the country. In the Eastern province, the collection was done in April and most populations had reached seed maturity at that time.

*Leersia* spp. which was spotted along the Mfuwe-Chipata road had just begun to flower and therefore there were no seeds at all. The Eastern province lies in the medium rainfall zone.

In Sesheke in the Western province, the plants were at the seed maturity stage and it appeared the team was there at the right time. Sesheke lies in the low rainfall region of the country.

The Northern and Luapula provinces which are both in the high rainfall zone exhibited a wide variation in terms of maturity times of the wild rice. It was generally observed that populations which grew in dambos matured early while those which grew in deep water such as in lakes matured late.

This problem of large differences in maturity of the different populations compounded with the high infertility rate made the quantities of seed finally obtained to be low.

All the *Leersia* spp. populations which were encountered were in the flowering stage which is an indication that this species flowers late in the season and therefore seed collecting should be targeted later in the year probably around July.

For future collecting activities, it is suggested that at least two visits are made to an area. The first visit can be made early in the season to target the early maturing populations and the second visit should be done later to capture the late maturing ones.

## **Acknowledgement**

We would like to thank the International Rice Research Institute for funding the whole mission. We would also like to thank the SADC Plant Genetic Resources Centre and the University of Zambia who contributed a lot to the success of the collection mission, including the Department of National Parks and Wildlife Service for providing the permits.

We wish to express our gratitude to the District Agricultural Officers in all the districts visited for their assistance.

Lastly but not least, we would like to thank the several villagers who helped the team in many ways including the use of their canoes.

## APPENDICES

### Itinerary

#### Province: Eastern

Date	Activity
14/4/97	Lusaka to Chipata
15/4/97	Chipata to Mfuwe
16/4/97	Collecting in Mfuwe GMA
17/4/97	Collecting in the Luangwa National Park
18/4/97	Collecting in Mfuwe
19/4/97	Mfuwe to Chipata
20/4/97	Chipata to Lusaka

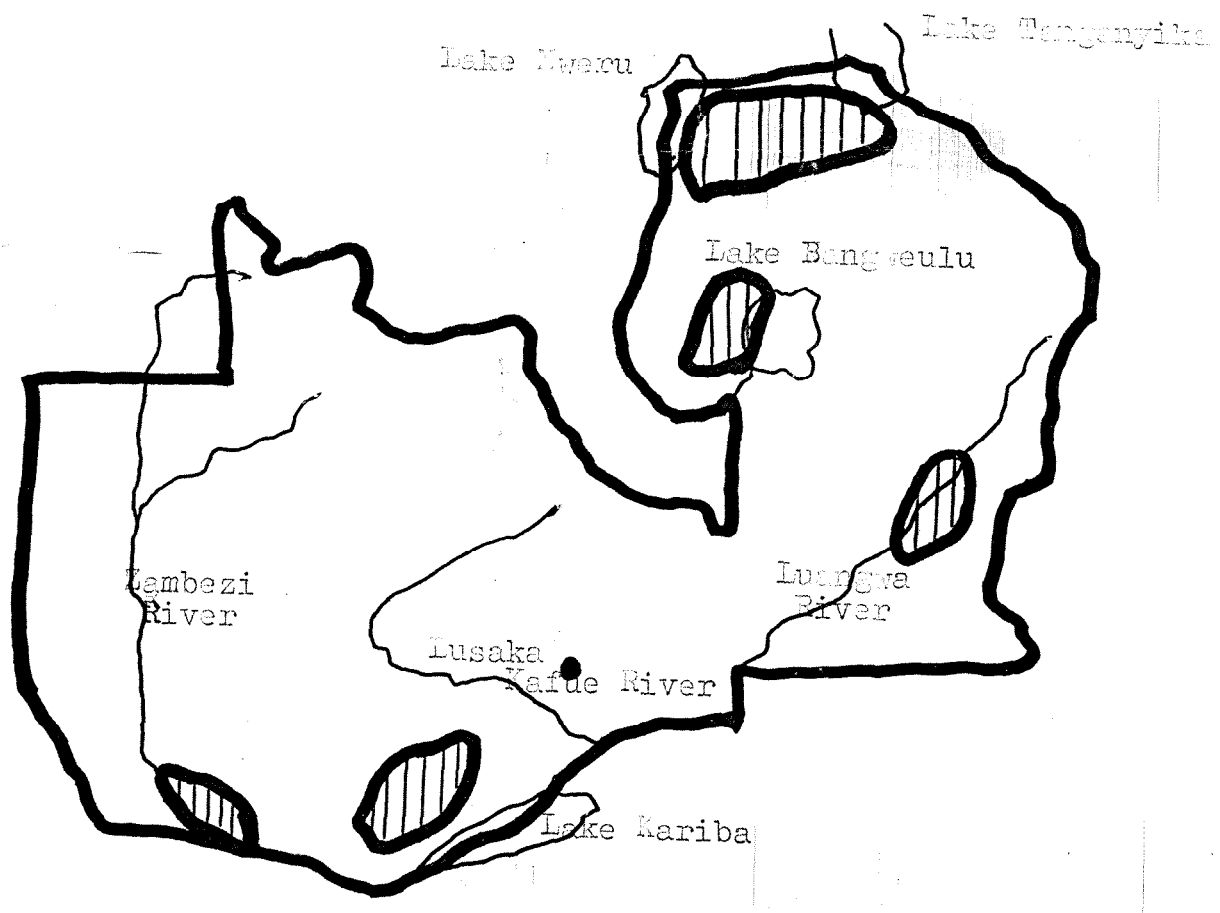
#### Province: Southern and Western

28/4/97	Lusaka to Monze
29/4/97	Collecting in Monze
30/4/97	Collecting in Pemba, Sinazongwe and Chisekesi
1/5/97	Monze to Livingstone
2/5/97	Livingstone to Sesheke
3/5/97	Collecting in Sesheke, Mwandi
4/5/97	Sesheke to Livingstone (Buying fuel)
5/5/97	Collecting in Sesheke
6/5/97	Vehicle breakdown in Sesheke ((repairing))
7/5/97	Sesheke to Livingstone
8/5/97	Livingstone to Lusaka




#### Province: Northern and Luapula

1/6/97	Lusaka to Mpika
2/6/97	Mpika to Mbala
3/6/97	Collecting at Kawimbe and Uningi pans, Mbala
4/6/97	Collecting at Zombe, Mbala north
5/6/97	Collecting in Mpulungu
6/6/97	Mbala to Kaputa
7/6/97	Collecting in Bulaya, Kaputa
8/6/97	Collecting in Kaputa west, Kaputa GMA
9/6/97	Kaputa to Nchelenge
10/6/97	Collecting in Nchelenge
11/6/97	Collecting in Nchelenge
12/6/97	Nchelenge to Samfya/collecting
13/6/97	Collecting in Samfya
14/6/97	Samfya to Lusaka

MAP OF ZAMBIA SHOWING AREAS COLLECTED ON THE WILD RICE GERMPLASM COLLECTION MISSION IN 1997



KEY:

-  AREAS COLLECTED
-  RIVERS
-  LAKES

Col no.	LAT PROV	DIR	LONG	DIR	ALT (m)	VILLAGE	DIST
	Deg	Min		Deg	Min		
NPL 001	13	11	S	31	54	E	663 Mfuwe Mambwe E
NPL 002	13	08	S	31	50	E	664 B.Zulu Mambwe E
NPL 003	13	17	S	32	01	E	675 Mpata Mambwe E
NPL 004	13	04	S	31	47	E	641 Luangwa Mambwe E
NPL 005	13	06	S	31	43	E	532 Luangwa Mambwe E
NPL 006	13	07	S	31	38	E	547 Mambwe E
NPL 007	13	30	S	32	27	E	923 Chiparamba Chipata E
NN 008	17	30	S	24	48	E	945 Mwandu Sesheke W
NN 009	17	29	S	24	28	E	945 Katongo Sesheke W
NS 010	08	57	S	31	22	E	5500 Uningi Mbala N
NS 011	08	50	S	31	32	E	5500 Kawimbe Mbala N
NS 012	08	46	S	31	06	E	790 Mpulungu Mpnlungu N
NS 013	08	36	S	30	00	E	1110 Bulaya Kaputa N
NS 014	08	36	S	30	00	E	1110 Bulaya Kaputa N
NS 015	08	54	S	29	00	E	1048 Mibala Kaputa N
NS 016	09	25	S	28	44	E	960 Kambwali Nchelenge L
NS 017	09	28	S	28	49	E	960 Nchelenge L
NS 018	11	15	S	29	31	E	1200 Ndobu Samfya L
NS 019	11	10	S	29	32	E	1198 Shimalingu Mbala L
NS 020	08	57	S	31	22	E	5500 Uningi Mbala N

**Note: PROVINCE**

E=Eastern  
W=Western  
N=Northern  
L=Luapula

Col. No.	Coll.Date	Coll.Name	Coll.Inst	Funding
Spp. Collected				
NPL 001	16/4/97	NPL NPGRC/UNZAIRRI		O.longistaminat
NPL 002	17/4/97	NPL NPGRC/UNZAIRRI		O.longistaminat
NPL 003	18/4/97	NPL NPGRC/UNZAIRRI		Sorghastrum spp
NPL 004	18/4/97	NPL NPGRC/UNZAIRRI		O.barthii
NPL 005	19/4/97	NPL NPGRC/UNZAIRRI		O.barthii
NPL 006	19/4/97	NPL NPGRC/UNZAIRRI		Sorghastrum spp
NPL 007	20/4/97	NPL NPGRC/UNZAIRRI		Leersia spp.
NN 008	3/5/97	NN NPGRC	IRRI	O.longistaminat
NN 009	4/5/97	NN NPGRC	IRRI	O.longistaminat
NS 010	3/6/97	NS NPGRC	IRRI	O.brachyantha
NS 011	2/6/97	NS NPGRC	IRRI	Leersia spp.
NS 012	5/6/97	NS NPGRC	IRRI	O.longistaminat
NS 013	7/6/97	NS NPGRC	IRRI	O.barthii
NS 014	7/6/97	NS NPGRC	IRRI	O.brachyanth
NS 015	8/6/97	NS NPGRC	IRRI	O.longistami
NS 016	10/6/97	NS NPGRC	IRRI	O.brachyanth
NS 017	11/6/97	NS NPGRC	IRRI	O.brachyanth
NS 018	12/6/97	NS NPGRC	IRRI	O.brachyanth
NS 019	12/6/97	NS NPGRC	IRRI	O.brachyanth
NS 020	3/6/97	NS NPGRC	IRRI	Leersia spp.

**Note: Collector's name**

NPL = Nawa, Phiri, Luwiika

NN = Nawa, Nguni

NS = Nawa, Shawa