



Institute of Economic Botany

The New York Botanical Garden

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PROJECT REPORT
INTERNATIONAL BOARD FOR PLANT GENETIC RESOURCES

EXPLORATION AND COLLECTING MISSION FOR MANIHOT ESCULENTA
Varietal Variation of Cassava in the Upper Amazon
Palcazu Valley, Peru

Grant Reference Number: 86/43

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- TRIP LOG -

DATES	LOCATIONS	MAP NUMERATION (see map)	BOTANICAL SPECIMEN NUMBERS COLLECTED (see collection forms)
JUNE 22	Arrive Lima.		
22-24	Lima - Trip preparations.		
25	to San Ramon, Chanchamayo.		
25-27	San Ramon - Trip preparations.		
28	to Palo Mar	(1)	7400-7405
29	to Cacazu	(2)	7407-7423
JUNE 29-JULY 1	Cacazu &		
	Yunculmas	(3)	7424-7428
JULY 2	to Pichinaz	(4)	7429-7439
2-4	Pichinaz &		7457-7473
	Azulis	(5)	7440-7456
5	to Nueva Aldea	(6)	7474-7479
	& Loma Linda	(7)	7480-7487
6	to Iscozacin - deposit collections to date.		
7	to Laguna	(8)	7488-7496
7-8	Laguna		
9	to Iscozacin	(9)	
9-13	Iscozacin as home-base with day trips to:		
	Shiringamazu	(10)	7497-7528, 7542-7552
	Alto Isco	(11)	7529-7532
	Buenas Aires	(12)	7533-7541
14	to Villa America	(13)	7553-7570
14-15	Villa America - with side trips to:		
	Santa Rosa de Chuchuras	(14)	7571-7584
	Tsopis	(15)	7585-7591
16	to Iscozacin - deposit collections and prepare for return trip.		
17	to San Ramon		
18	to Oxapampa &		
	Tsachopen	(16)	7592-7598
19	to San Ramon - transfer germplasm to Satipo.		
20	to Lima		
20-24	Lima - prepare specimens and send germplasm.		
25	leave Lima.		
NOVEMBER 6-9	Cali, Colombia - review germplasm transfer and electrophoresis investigation; deposit characterization data.		

MAJOR CONTACTS

Dr. Claus Robin Head of Tropical Research Stations Agricultural University of Peru La Molina, Lima	at Satipo Experimental Station received germplasm collection for duplication, evaluation and preservation.
Ing. Homer Tuesta Head of Agriculture Unit Special Project - Palcazu Valley	at Iscozacín received and planted germplasm collection; reports 100% germination.
Dr. Guillermo Delgado Expert in <u>in vitro</u> transfer National University Pedro Ruiz Gallo Lambayeque, Peru	received germplasm collection, made <u>in vitro</u> transfer, preserved collection, and made transfer to CIAT.
Dr. Willi Rocha Biotechnology Unit CIAT	received germplasm collection <u>in vitro</u> and is storing and duplicating for electrophoresis and field studies.

GENERAL DESCRIPTION OF AREA OF COLLECTION

The Palcazu Valley in east-central Peru is ecologically characterized as moist tropical rainforest. Iscozacín, the largest village in the valley (approx. 200 inhabitants) receives over 6000mm of rain annually with indications that Laguna and Pichinaz receive progressively more, and Cacazu and Oxapampa, located in minor rain-shadows, receive less precipitation. This extraordinarily high rainfall is the unique incentive for collecting cassava in the region, along with the precipitous altitudinal gradient ranging from 4000m to 250m. Other aspects more generally true of the eastern Peruvian Andes include: high genetic diversity of cassava; local divergence and adaptation; predominance (to exclusiveness) of sweet varieties; indigenous slash-and-burn agricultural practices (Table 1. lists crops associated with cassava in such fields); indigenous cultivation, breeding and uses; indigenous cultural and belief systems associated with cassava; etc. All of these attributes need to be documented and, where possible preserved, before the great changes occurring in the Upper Amazon region obliterate the information and genetic material still available.

ESTIMATES OF GENETIC EROSION

The changes in the Upper Amazon and particularly the Palcazu Valley include all of the threats to genetic erosion and diversity enumerated by the International Board for Plant Genetic Resources: (i) man (roads and construction) - a major Amazonian perimeter road has just entered the Palcazu Valley which previously had access to the outside world only by river, air and footpath; (ii) agriculture (new crops and farming

Table 1. Crops sampled in Amuesha slash-and-burn agricultural plots in the lower Palcazu Valley, Peru.

PLANT FAMILY	COMMON NAMES			
	<u>Genus</u>	<u>English</u>	<u>Spanish</u>	<u>Amuesha</u>
ARACEAE				
	Colocasia *	taro	pituca	petoca'
	Xanthosoma *	cocoyam	pituca	petoca'
BIXACEAE				
	Bixa *	annatto	achiote	yetse'p
BOMBACACEAE				
	Quararibea		zapote	
BROMELIACEAE				
	Ananas *	pineapple	pina	tohuan
CARICACEAE				
	Carica	papaya	papaya	papue'
CONVULVULACEAE				
	Ipomea *	sweet potato	camote	yom
CUCURBITACEAE				
	Citrullus	watermelon	sandia	
	Cucumis	cucumber	pepino	
	Cucurbita	squash	zapallo	
DIOSCOREACEAE				
	Dioscorea	yam	sachapapa	cho
ERYTHROXYLACEAE				
	Erythroxylum *	coca	coca	coc
EUPHORBIACEAE				
	Manihot *	cassava	yuca	mam
GRAMINEAE				
	Coix	Job's tears	trigo tropical	
	Oryza *	rice	arroz	
	Saccharum	sugar cane	cana de azucar	senorr
	Zea	maize	maiz	chop
LAURACEAE				
	Persea	avocado	palta	parte'
LEGUMINACEAE				
	Arachis	peanut	mani	chech
	Cajanus	pigeon pea	frijol de palo	
	Inga *	inga	pacae, guaba	ap'
	Pachirrhizus *	yam bean	ashipa	
	Phaseolus	lima bean	pallar	
	Phaseolus	kidney bean	frijol	coch
	Vigna *	cowpea	chiclayo, caupi	
MALVACEAE				
	Gossypium *	cotton	algodon	be's
	Hibiscus	okra	"nescafe"	
MARANTACEAE				
	Calathea *		daledale	shermue
MORACEAE				
	Artocarpus	bread fruit	pan de arbol	
	Pourouma		uvilla	
MUSACEAE				
	Musa	plantain, banana	platano	parant

MYRTACEAE

Psidium * guava guayaba llom

PALMAE

Bactris * peach palm pijuayo, pejibaye poporr

RUTACEAE

Citrus * grapefruit toronja
 Citrus * lime limon llem
 Citrus * orange naranja naranc
 Citrus * sweet lemon limon dulce
 Citrus * tangerine mandarina

SAPOTACEAE

Pouteria sapote caimito

SOLANACEAE

Capsicum * chili pepper aji tots
 Lycopersicon tomato tomate
 Physalis Cape gooseberry capuli shemots
 Solanum * peachtomato cocona
 Solanum * coconilla

STERCULIACEAE

Theobroma cacao cacao

practices) - the impact of cash crops and extensive cultivation is already noticeable with accompanying neglect of traditional varietal diversity; (iii) disasters are less prominent, although flooding is experienced frequently with grave effects on cassava production. In general, Amazon basin flooding is increasing dramatically and commonly attributed to ecological degradation, especially deforestation. I might add a fourth category of culture - many of our best informants were very old people with whom traditional knowledge and practices are dying.

GERMPLASM PRESERVATION

The collection of almost 200 accessions is planted in the field for duplication and evaluation at Iscozacín, Palcazu Valley and at Satipo with the Peruvian Agricultural University. The accessions are cultured in vitro at the National University of Pedro Ruiz Gallo, Lambayeque, Peru and those adapted are planted in the field there. Duplicates of these in vitro accessions have been transferred to CIAT in Colombia for permanent preservation, and for field duplication, characterization, evaluation, and screening. Botanical specimens will be deposited at CIAT, The New York Botanical Garden, Natural History Museum (Lima), and other botanical collections.

GERMPLASM CHARACTERIZATION

Characterization of ecological, biological and morphological parameters was done with the collection; morphological characterization is being done from botanical specimens at The New York Botanical Garden; and further evaluations and screening will be done in the field in Peru and at CIAT. CIAT, additionally, is undertaking isoenzyme electrophoresis characterization to be compared at NYBG with morphological and indigenous systematics. The characterizations will then be related to environmental and geographical data gathered in the valley. All information will be deposited in Peru, at CIAT, and published for the general scientific community.

DIFFICULTIES ENCOUNTERED

The trip was extremely productive with only minor inconveniences (ie. clogged gas filter, rain, difficult communications, primitive transportation networks, etc.). The major problem at present is transfer and maintenance of the collection in vitro, and growing it out for electrophoresis and field evaluations. To follow up on this aspect the mission leader took a stop-over in Cali. Progress is being made.

The budget was generally followed although certain categories deviated slightly from the original figures (ie. car rental was more expensive by the time the trip was made, the trip and collection processing took slightly longer than anticipated, etc.) but by transferring funds between categories it was possible to adhere to the original budget.

BUDGET OUTLINE

SUBSISTENCE: d = days, p = persons
June 22-24 in Lima 3d x 2p x \$59 = \$354
June 25-July 19 in field 25d x 2p x \$20 = \$1000
July 20-25 in Lima 5d x 2p x \$59 = \$590
November 6-9 in Cali 3d x 1p x \$59 = \$177
TOTAL = \$2121.00

TRAVEL:
Car rental \$1489.93
Gasoline \$127.49
Parking \$4.34
Taxis \$25.49
TOTAL = \$1647.25

EQUIPMENT:
Tape recorder and tapes TOTAL = \$135.45

EXPENDABLES:
Germplasm transfer \$ 1200.00
Telex, telephone \$ 27.61
Mailing specimens \$ 27.43
U.S.Govt. commissary \$ 83.25
Air cargo \$ 54.51
Xerox and binding \$ 45.54
Supplies, misc. \$ 186.50
TOTAL = \$1624.85

CONTINGENCIES:
Assistant retainer \$ 1320.00
Native guides, informants \$ 190.00
TOTAL = \$1510.00

TOTAL EXPENDITURES = \$7038.54

GRANT FUNDING = \$7000.00
ADVANCE RECEIVED = \$6300.00

AMOUNT DUE TO THE NEW YORK BOTANICAL GARDEN = \$ 700.00

REPORT ON TRIP TO PERU

Edward Carey

July 6-21, 1986

The purpose of this trip was to collect cassava germplasm in the Palcazu valley of Peru. This lowland tropical valley has extremely high rainfall--around 6,000 millimeters per year. Dr. Jan Salick received a grant from the IBPGR to collect cassava varieties amongst the Amuesha (indigenous people) who are traditional cassava farmers in this valley. I joined the expedition with the hope of gaining some experience at germplasm collecting, and with an interest in observing traditional cassava cultivation by an indigenous group. Both of these objectives were fulfilled. I also had the opportunity of visiting the PEPP/AID development project camp at Iscozacín, of seeing the cassava germplasm collection there, and of talking with some of the personnel about their plans for future work with cassava.

The Palcazu valley is populated by the Amuesha who practise a traditional swidden agriculture and raise some cattle, and by German colonists who arrived around 150 years ago and mostly raise cattle. Recent colonization has not been permitted by the Peruvian government and so the valley remains in a relatively pristine condition, with much primary forest and no obvious declines in soil fertility under the traditional cropping systems.

I joined the expedition at approximately its midpoint. Jan Salick and a botanist, Sandy Knapp, had been collecting for around two weeks as they moved down from the head of the valley at an elevation of about 1500 meters to Iscozacín at 375 meters above sea level.

During my visit we collected in communities around Iscozacín and, on our return trip to Lima, at Oxapampa (elevation 1,800 meters) - see attached itinerary. We collected cuttings, botanical specimens, and "passport" data in farmers' fields. We collected cuttings for two germplasm collections in Peru - for the PEPP/AID station at Iscozacín and the Universidad Nacional, La Molina station at Satipo - and for CIAT. The CIAT materials are to be transferred to tissue culture by Prof. Guillermo Delgado of the Universidad Nacional, Lambayeque. Dr. Jim Brian of CIP will handle Peruvian phytosanitary and germplasm export permits.

We made around 200 collections during the trip, and while there are certain to be some duplicates, I hope that materials which are valuable for the lowland humid tropics (ECZ 3), the lowland tropics with a prolonged dry season and acid soils (ECZ 2) and the highland ecosystem (ECZ 5) will be identified.

The number of varieties encountered in farmers' fields ranged from one to 40 with the majority of plots containing between 5 and 15. Farmers gave various reasons for planting mixtures. It would be interesting to investigate further the reason(s) for this almost ubiquitous feature of traditional cassava cultivation.

All of the cassava plantations which I saw looked extremely healthy but various diseases and insects were present at low levels. I cannot diagnose with certainty all of the diseases which I saw present. Nonetheless it appeared to me that superelongation disease (Spaceloma manihoticola), cassava bacterial blight (Xanthomonas campestris), brown leafspot (Cercosporidium henningsii), blight leafspot (Cercospora vicosae), rust (Uromyces spp.) and various unidentified foliar diseases were endemic to the area. The high rainfall and generally cool temper-

atures which prevail in the area should be favorable for epiphytotics of superelongation. Thus it is likely that high levels of resistance to this disease exist amongst the cassava varieties present in the area. It will be interesting to test this hypothesis at Carimagua, Colombia where conditions are known to be epiphytotic-inducing.

Whitefly, Vatiga and thrips were all present at low levels. The Amuesha farmers consistently stated that cassava had no serious disease or pest problems. One farmer did complain, however, that his varieties were susceptible to tempests and earthquakes.

While at the PEPP/AID project headquarters in Iscozacín I spoke with the project agronomist Charles Staver, with Ingeniero Homer Tuesta who is head of the crops unit in the project, and with Carmen Tuesta who is in charge of cassava germplasm maintenance and evaluation. The status of cassava in the development project in the Palcazu valley was not very clear to me. Carmen Tuesta told me that there were plans to select the best variety from among the germplasm accessions and to plant five hectares with it. She seemed sceptical about the likelihood of this goal actually being achieved, and unsure what use the cassava would be put to. I looked at the well-kept cassava germplasm collection with Carmen Tuesta and helped make arrangements for the addition of the newly collected materials to the collection. I will send Carmen some suggestions on cassava germplasm maintenance and evaluation, as well as some CIAT literature. Carmen expressed interest in taking part in a CIAT production course.

Probably it was with the impetus of the recent CIAT/PEPP/AID work on fresh cassava that the germplasm collection was established at Iscozacín. Where they are going from here is not very clear. There was no obvious need for new varieties in the areas of the Palcazu which I

saw. If commercialization of cassava is encouraged in the Palcazu, this will require the clearing of more forest for farm plots, a process which is already proceeding fairly rapidly due to pasture clearing. As far as utilization goes, dried cassava seems to be out of the question because of the exceptionally high rainfall in the area. Fresh cassava would have to be gotten to market via the plastic bag technique and this technology might be a bit out of reach for people who currently use no agricultural chemicals. Additionally, there is only one road in the valley, and access to it is difficult for the majority of the people.

Those are my views about current prospects for cassava commercialization in the Palcazu valley. It is possible, on the other hand, that there might be a more favorable environment for cassava commercialization in the Pichis valley or in the nearby Satipo region. For up to date comments on this, please refer to the trip report of Chris Wheatley (25 May - 18 June, 1986).

Some of the work being done by Charles Staver at the development project is worth mentioning. Of particular note were the promotion of lowland coffeea (Coffea canephora) as a cash crop which can be grown with varying levels of inputs, and the pasture renovation work using Brachy-eria decubens and Desmodium ovalifolium(?). The pasture renovation technology is supposedly being rapidly adopted by the German colonists in the valley.

In conclusion, the trip was well worth while. The germplasm collected will almost certainly prove to be useful. And I can only hope that the time spent visiting farmers fields, collecting their varieties, talking with them and observing their practises will prove valuable to me as a cassava breeder.

ITINERARY

July	6	Bus to Bogota
July	7	Fly to Lima
July	8	Take colectivo to San Ramon
July	9	Fly San Ramon to Iscozacin
July	10	Collect in Shiringamazu
July	11	Collect in Alto Isco
July	12	Collect in Buenos Aires
July	13	Collect in Shiringamazu
July	14	Walk to Villa America - Collect in Villa America
July	15	Collect in nearby community (I forget the name)
July	16	Return to Iscozacin by boat
July	17	Depart for San Ramon by Road
July	18	Arrive San Ramon, Depart for Oxapampa
July	19	Collect in Oxapampa, Return to San Ramon
July	20	San Ramon - Lima by land
July	21	Return to Cali by air
July	22	Remain in bed with strep throat

Lambayeque, 19 de Octubre de 1987

GED - 097 - 87

Doctor
CLAIR HERSHEY
CIAT - Apartado 6713
Cali - COLOMBIA

Estimado Doctor Hershey:

Tal como habíamos acordado en CIAT, he revisado los mapas y las rutas que la Dra. Salick utilizó en su reciente viaje de colección de yuca. Creo llegar a las siguientes conclusiones:

a. Referente al Departamento de Junín, la colección se realizó únicamente en la Provincia de Chanchamayo. Las localidades de Alto Santa Herminia, El Palomar y Enegñas, lugares específicos de la colección (7400 - 7405), no figuran en el mapa de allí que deben tener inferior categoría al de distrito; sin embargo, resulta claro que se encuentran a lo largo de la carretera La Merced (Junín) - Oxapampa (Pasco).

b. Referente al Departamento de Pasco, la colección se realizó únicamente en la Provincia de Oxapampa (7407 - 7598) a lo largo de la carretera que pasando por Villa Rica conduce a Puerto Mairo (Valle del Río Palcazu). De todas las localidades que la Dra. Salick menciona en su colección sólo Loma Linda, Shiringamazu e Iscozacín figuran en el mapa, las otras deben ser muy pequeños caseríos.

c. Referente a los nombres locales de las colectas lamento no poder ayudarle en su desciframiento.

Para un mayor entendimiento de lo expuesto le hago llegar los mapas y una relación en castellano de los lugares de colección.

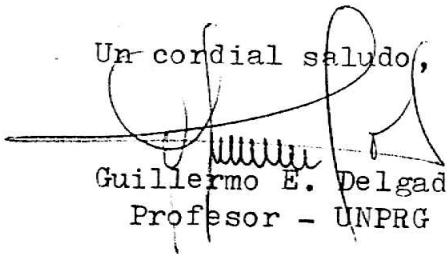
Por otro lado, está claro que la Dra. Salick realizó + 198 colectas, de las cuales se envió a CIAT por cultivo de meristemas 153; de ellas 26 llegaron en regular o mal estado y desconozco si se recuperaron. De ello se deduce que alrededor del 25% de esta colecta no la tenemos ni nosotros ni Uds., por lo tanto considero oportuno se estudie la posibilidad de obtenerla. Ante ello pregunto: ¿Dónde se encuentra la colección de campo original? ¿Es posible obtener duplicados de ella en forma de estacas y llevarlas a Lambayeque? ¿Estaría CIAT dispuesto a financiar el traslado de este material y su pasaje a in vitro para luego remitirlo al BRU del CIAT?

Iscozacín
Central Selva
Project in
Palcazu Valley;
also in Satipo,
Expt. station

Espero que la información que le envío y la propuesta que planteo sea de utilidad para Uds. Oportunamente le haré llegar otras propuestas relacionadas con proyectos de colección de yuca en la costa norte y nor oriente del país.

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Un cordial saludo,


Guillermo E. Delgado
Profesor - UNPRG

P.D.: Considero que esta información debe ser del conocimiento de los Drs. William Roca y Miguel Holle.

SALICK CASSAVA COLLECTION: PALCAZU VALLEY, PASCO - PERU

Dpto. Junín, Prov. Chanchamayo

- C.N. Alto Santa Herminia. El Palomar, 7 Km de Eneñas (7400 - 7405)

Dpto. Pasco, Prov. Oxapampa

- Cacazú, C.N. Unión de la Selva (7407 - 7423)
- Yuncullmas Km 48 (7424 - 7428)
- San Francisco de Pichanaz (7429 - 7439)
- Azulis en Río Bocas cerca a la confluencia con el Río Azulis (7440 - 7456)
- San Francisco de Pichanaz (7457 - 7467)
- Al sur del puente del Río Palcazu, entre Azulis y San Francisco de Pichanaz (7468 - 7473)
- Nueva Aldea, C.N. Loma Linda - Laguna, 19 Km del camino a Palcazu (7474 - 7479)
- Loma Linda, Km 23 del camino a Palcazu (7480 - 7487)
- Laguna, Río Raya (río arriba) (7488 - 7496)
- Shiringamazu (7497 - 7528)
- Alto Iscozacín (7529 - 7532)
- Buenos Aires (7532 - 7541)
- Shiringamazu, Km 42 del camino a Palcazu (7542 - 7552)
- Villa América (7553 - 7571)
- Santa Rosa de Chuchurra (7572 - 7584)
- Pampa Hermosa de Tsopis (7585 - 7589)
- Tsopis (7590 - 7591)
- Tsachopen, Río Chorobamba (río abajo) (7592 - 7598).