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Root crop storage and processing in the Philippines

Julie C. Diamante

The Philippine government has launched a National Development Plan to meet the growing food and income needs of the 54 million Filipinos. Its main emphases are: food and nutrition, the development of export markets, energy production, import substitutions, and income generation and distribution.

Increasing food production and improving postharvest technology will therefore receive considerable attention over the next five years at the Philippine Root Crop Research and Training Center (PRCRTC). A major strategy is to increase crop production by encouraging root crop growers to improve their traditional subsistence farming systems. Reducing postharvest losses, in particular, receives priority because such losses significantly lower the yearly national income.

The government's plan is geared toward postharvest research and the development of the most important commodities, such as cassava. The government is encouraging root crop production, especially cassava, in order to

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Contents

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increase incomes and generate employment. Cassava is singled out for development because it has a high-yield potential, is adaptable to differing production systems found in different ecological regions of the tropics, and is an important source of food, animal feed, and industrial products. The product can also supply the raw material needed by starch factories and can partially substitute yellow corn in animal feed.

Production of root crops

Cassava is a secondary or substitute crop for rice and corn in the Philippines. Most Filipino farmers plant cassava on poor, marginal soils.

These subsistence systems yield an average of nine tons of cassava per hectare. The low productivity is caused by a number of factors, including: poor land preparation, early harvesting materials, poor fertilization, poor insect, disease, and weed control, inadequate crop density, and poor crop development.

For the past few years researchers have been concerned with improving production management and the development of high-yielding varieties. They have obtained dramatic yield increases, from 9 to 40 tons per hectare, through better management and the use of high-yielding varieties developed by the PRCRTC.

Handling and storage of root crops

The high perishability of root crops is a major problem for growers and processors. In any postharvest handling and storage operation the main concern is to preserve the quality of the crop after harvest and to improve, where possible, its taste. Good handling and storage preserves a crop's harvest-fresh quality.

The choice of packaging materials is also important, especially if the roots are to be shipped. Proper packaging of the root will prevent moisture loss and, hence, weight loss during transport. Curing techniques have been developed that can actually heal damaged roots which are to be stored: the roots are subjected to a combination of high temperatures and humidity at the beginning of the storage period. A technology for cassava storage has also been developed at PRCRTC, at the Visayas State College of Agriculture (ViSCA), Baybay, Leyte, in which losses have been minimized by underground storage and the use of packaging mediums such as soil or sawdust. The technology is being accepted by Philippine farmers.

Root crop processing

Increased productivity and better root crop storage methods are encouraging root crop growers to move from subsistence to commercial farming. Even producers and processors of conventional foodstuffs are becoming involved in root crop industries, such as chips, starch, and flour.

The national root crop processing program is actively involved in the production of chips, flour, and starch for food, animal feed, and some industrial uses. The Philippine government has four objectives for chip research:

To close the present supply gap for animal feed grains and so provide a steady supply of low cost quality feeds;

To provide farmers with better production and processing technology by establishing root crop production areas and chipping centers in those provinces where potential markets exist;

To generate more employment by developing chipping facilities; and

To generate foreign exchange through the exportation of cassava chips.

In 1984, the ViSCA Animal Feed Processing Pilot Project was established at ViSCA. The project's main objectives were:

To establish a pilot mill for the ➡

ViSCA in the Philippines is a world leader in cassava research.

commercial production and marketing of animal feed formulas developed from root crops;

To produce cheap, high-quality feeds from root crops for local and small animal raisers and small animal feed dealers within the service area;

To research, develop, test, and promote technology to support the pilot mill; and

To extend and expand resources for the organization and training of farmers in cassava chipping techniques.

The operation of the pilot mill raised issues which must be considered if the project is to expand successfully and effectively throughout the Philippines and to other countries (Gerona, 1985). The main issues are:

Current chip production cannot keep up with demand because of a shortage of planting materials and therefore of root production;

Possible diversion of that cassava which is high in hydrocyanic acid from processing into starch to chipping for animal feeds, the prices and demand of which are better;

Concern of animal feed processors and users about aflatoxins (fungal toxins) in the chips; and

Postharvest chipping and drying problems.

At present, there are 12 starch manufacturers and 95 animal feed processors in the country. It is estimated, however, that they operate at only 20% to 40% capacity because of the lack of raw materials, low productivity, lack of planting materials of high-yielding varieties, poor crop management, and lack of an efficient marketing system.

An increase in demand for root crop flour due to increased consumption of baked products is also observed in the Philippines market. The substitution of cassava flour for imported wheat flour in baked products and noodles has been studied.

Nonfermented cassava food products. Nonfermented food products from cassava such as cassava chips and cassava shrimp sticks, have been developed at ViSCA (Lauzon, 1985). For cottage industries, food products such as cassava bread, *suman* (grated cassava mixed with sugar and coconut milk) and *polvoron* (cassava flour mixed with skim milk, margarine, and sugar) have been developed (Pepino, 1985).

Fermented food products. Soy sauce, using traditional methods, is produced from a mixture of soybean mash, wheat flour, and fermentation microorganisms. Because wheat flour is imported, highly priced, and scarce, its use in soy sauce production is limited. PRCRTC has successfully substituted cassava flour for wheat flour in soy sauce production. Tests show comparable palatability between soy sauce produced with a cassava base and that which is commercially produced with a wheat base.

In 1985, tests were conducted to enrich cassava animal feeds with protein supplements since chips alone cannot totally replace protein concentrates in feed rations. It was found that although palatability was comparable to nonprotein-enriched root crops and corn, digestibility appeared to be lower. Follow-up research, however, is planned to produce better quality and cheaper protein-enriched feed.

Market potential for root crops and root crop products

Fresh roots. In the Philippines, the production of root crops such as cassava, appears to supply the needs of the processing industries because of the presumed marketable surplus. In 1981, the 211,370 ha planted in cassava yielded 2.1 million metric tons of roots (Ministry of Agriculture and Food, 1981). Several studies, however, have shown that 61% of the production was used at home, 38% was sold, and the remaining 1% was given to neighbors and friends (Alkuino, 1985). In 1981, cassava starch processing plants operated at only 50% of their total milling capacity of 700 metric tons per day. Root production had been lower than usual, limiting the supply of raw materials for processing. If the processing plants were to operate at full capacity, they would require 515,000 metric tons annually. Obviously, increased production is needed to supply the starch processors.

Processed root crop products. Cassava and sweet potatoes are considered as inferior foods by the Filipinos. An increase in income results in a decreased consumption of these foods. However, the consumption of processed root crop products increases as incomes increase, although there is a high elasticity between consumers' income and the amount consumed.

It is clear that the economy of the Philippines can be improved by a greater root crop production. The country's national research and development plan should therefore lead to increased production of fresh and processed root crops with the resulting benefits being channeled toward the economic sector.

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Biologically controlling destructive cassava mites with Phytoseiidae mites

Nora C. Mesa and Anthony Bellotti

Cassava, a staple food crop that originated in the South American tropics, is today found in widely diverse ecological zones, principally in South America and Africa. Nevertheless, the crop is attacked by many types of pests such as phytophagous mites which severely attack foliage and cause substantial production losses. To date, about 50 species of phytophagous mites have been reported, most of which belong to the Tetranychidae family and the most outstanding of which are species from the genera *Mononychellus* and *Tetranychus*. They are particularly destructive during dry seasons when they reach high infestation levels.

Given the importance of pests in cassava production, various methods and integrated techniques in their control have been investigated, the most important of which are chemical, cultural, biological, and resistant-variety controls.

The natural controls of tetranychids in cassava are predatory insects and mites. Among the insects are Coleoptera of the Coccinellidae and Staphylinidae families, Diptera of the Cecidomyiidae and Syrphidae families, and Neuroptera of the Chrysopidae family. Among the predatory mites are some Cheyletidae species, but most are from the Phytoseiidae family whose species are diverse and efficient.

Phytoseids have been used successfully in the biological control of harmful mites in flower and vegetable greenhouses because of their short life cycles, small size, high searching capacity, good survival at low prey densities, low nutritional requirements, and their ability to use alternative food sources such as pollen, fungi spores, or insect secretions. These qualities are of special interest if such predatory mites are to be considered as a biological component in an integrated plan for cassava mite control.

Searching for natural enemies

In order to control mite populations that adversely affect cassava crops, basic studies of their natural enemies were developed. The studies searched for predatory mites at the crop's and pests' place of origin in South America, mass-reared the predators, and released them in the cassava fields of other countries, such as those of Africa. Under field conditions their adaptation and efficiency as predators were then to be monitored.

The project was developed by CIAT, the Commonwealth Institute of Biological Control (CIBC), and the International Institute of Tropical Agriculture (IITA). CIAT is systematically searching for the natural enemies in cassava-growing areas: first in Colombia and then in other Latin American countries that have phytosanitary problems with cassava such as Venezuela, Brazil, Mexico and Paraguay. These searches take into account climatic patterns, especially precipitation and duration of wet and dry seasons, and type of ecosystems, particularly savannas which are similar to those of the cassava-growing belt of Africa.

As a result of these searches 32 species of Phytoseiidae mites have been found in Colombia, three of which were previously unknown to scientists. All 32 species are found in foliage and in association with their prey—tetranychid mites that attack cassava. Their frequency distribution is shown in Figure 1.

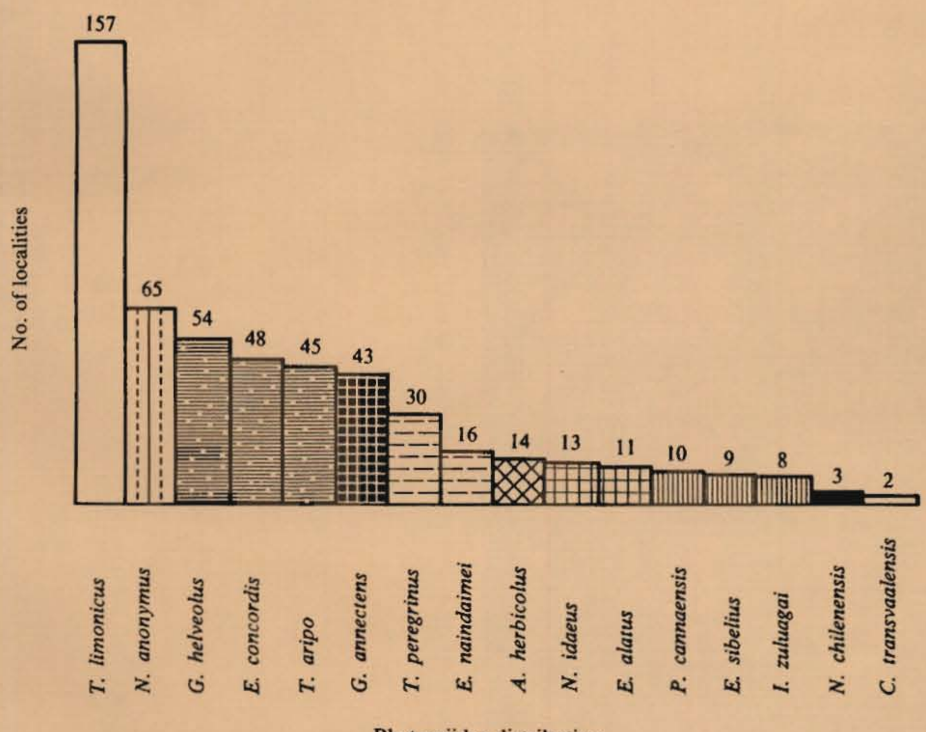


Figure 1. *Frequency distribution of some of the Phytoseiidae species found in Colombia.*

Mesa-Bellotti method for mass rearing

Once the predatory species were identified, suitable ones were selected for colonization and mass rearing in the Cassava's Program Mite Project in Palmira, Colombia. It was necessary to design simple and economic rearing techniques for both phytophagous mites and predatory phytoseids. CIAT researchers succeeded in designing an efficient and low-cost method to rear the mites, the Mesa-Bellotti method (see box), which consists of a plastic tray containing two thread-like supports, horizontally dividing the tray's compartment. Each support is covered with cassava leaves already infested by a large population of phytophagous mites—the food of the phytoseids which are then introduced. Every second or third day the foliage on the upper support is removed to the lower support and fresh leaves with abundant prey are added to the upper support. This allows the predators to search freely for food without being handled.

The method has worked for various species of phytoseids, for example, *Neoseiulus anonymus, N. chilenensis, N. idaeus, Typhlodromalus limonicus, Phytoseiulus macropilis*, and *Galendromus annectens*, making it possible to increase populations of confined predators in a simple and economic manner. Studies to determine some of the biological aspects of the beneficial species have also been undertaken. This includes the effect of temperature on their development, and eating habits such as prey preferences and daily consumption capacity.

Results show that *Typhlodromalus limonicus* is widely distributed in Colombia, in the departments of Valle del Cauca, Santander, Tolima, Huila, and those on the north coast within the cassava-growing areas with a temperature range of 15-35 °C.

The species' development from egg to adult takes 4.8 days at 25 °C and 70% ± 5% relative humidity. A female lays an average of 1.57 eggs per day and eats an average of 4.03 eggs, 10.6 larvae, 6.6 nymphs, and 34 adults of *Mononychellus progressivus* during its adult life. *T. limonicus* is a predator with a preference for the adults of *M. progressivus*. It should be noted that this phytoseid increases its populations in substrates infested by the cassava mealybug, *Phenacoccus herreni*—another important crop pest.

Studies on *Neoseiulus anonymus*, the second most widely distributed species in Colombia, have located the predator in the departments of Valle del Cauca, Tolima, Cesar, and Bolívar where average temperatures are between 20 and 35 °C. This species grows from egg to adult in an average of 4.0 days at 25 °C and 70% ± 5% relative humidity. A female lays an average of 2.8 eggs per day and eats 78.3 eggs, 28 larvae, 5.1 nymphs, and 4.7 adults of *Tetranychus urticae*— its favorite prey.

Similar studies are being undertaken for other species of the Phytoseiidae, such as *Neoseiulus idaeus* (Figure 2), *Galendromus annectens*, *Euseius concordis*, and *N. chilenensis*.

One of the objectives of the Mite Project is to send the most promising predator species to Africa. A plan has been initiated to periodically send five species: for example, *T. limonicus*, *N. anonymus*, *N. idaeus*, *G. annectens*, and *E. concordis*, using the Mesa-Bellotti method, in which one leaf carries a large number (1000 to 2000) of *Mononychellus progresivus* mites at all stages of development as food. The leaf's petiole is placed inside a vial containing water and sealed with parafilm to prevent water loss. The leaf with the vial is placed within a petri dish containing filter paper to absorb any excess water that may be formed in the dish. The vial is taped to the base of the dish to prevent movement from killing the mites. The phytoseids are then introduced, the dish is sealed, and made airtight with masking tape. The prepared dishes are placed in a styrofoam container with a layer of ice on the bottom. The ice layer helps maintain a low temperature inside the container (Figure 3) to slow down metabolic activity, thereby checking the voracity of the mites..

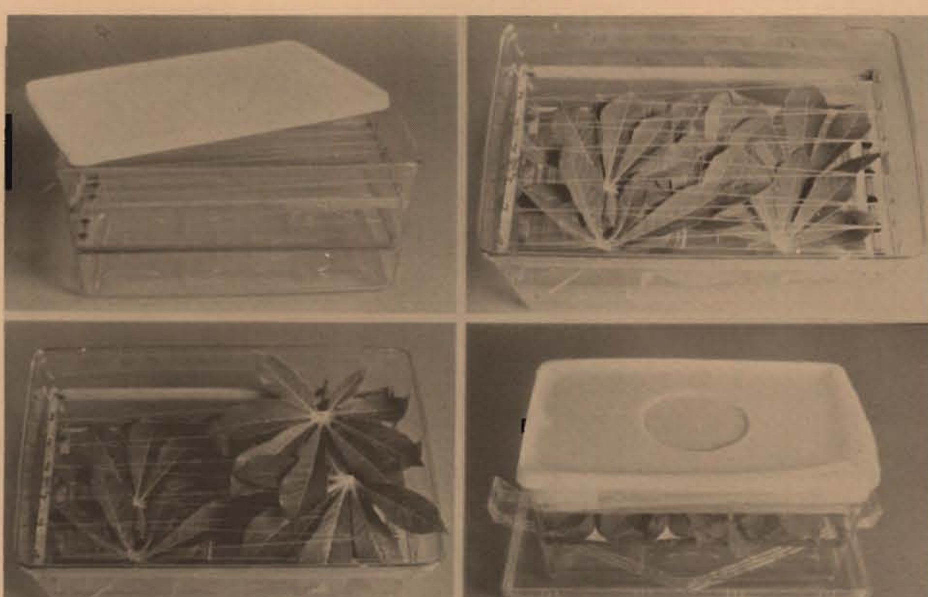
The shipment passes through CIBC in London, England, which serves as a quarantine station to check the status of the material and to prepare it for shipment to Africa.

The Project's aim to efficiently establish Phytoseiidae under field conditions in Africa is now being achieved. Difficulties inherent in this type of work are gradually being analyzed and corrected in order to guarantee successful results.

Figure 2. *Using predatory mites such as* Neoseiulus idaeus *to control cassava-damaging mites is an effective means of keeping pests at a harmless level.*

Figure 3. *Predator mites (Phytoseiidae) are sent in petri dishes to CIBC, England, for quarantine.*

Figure 4. *Rearing unit used in the Mesa and Bellotti Method: Upper left, empty tray; right, lower support where leaves with phytophagous mites have been placed; below left, upper support with fresh, infested leaves; right, sealed tray placed in moat.*



Mesa and Bellotti rearing method

The rearing unit (Figure 4) is a rectangular, covered tray made from transparent plastic and measures 30 x 25 x 20 cm. In the lid of the tray a 10-cm diameter hole is sealed with filter paper, providing aeration and preventing mite escape. Two "supports" made of nylon threads about 3 cm apart are each threaded, zigzagged fashion, onto an aluminium frame which is placed horizontally within the tray, one above the other. The first support is 5 cm from the tray's bottom and the second is 5 cm above the first support. Initially, cassava leaves containing phytophagous mites are placed on the lower support and about 50 phytoseid females are dropped in. After 3 days (actual time may vary with the species), when the prey has been consumed and the leaves start to deteriorate, new infested leaves are added to the upper support, allowing the predators to migrate upward in search of prey. Three days later the leaves on the lower support are removed and replaced by those from the upper support and new prey-infested leaves are added to the upper support. This process is repeated continually. One tray can maintain a colony of about 500 to 800 predator individuals, depending on the species. Each tray is sealed with masking tape and placed in a moat consisting of a shallow tray containing water to prevent escape and migration to other colonies. ■

Colombian cassava producers discuss the progress of drying plants

Nubia Fuentes, Manager of COYUPEZ, El Paso, Cesar.

A series of interviews were held by **Cassava newsletter** with representatives from various rural cooperatives to assess their reactions to the use of cassava drying plants on the north coast of Colombia. The projects were initiated by the Colombian Rural Development Program (DRI) with technical support provided by CIAT.

Nubia Fuentes is the only woman who heads a cooperative on Colombia's north coast (COYUPEZ). The members are engaged in cassava drying and aquaculture.

Cn: How did you become interested in this project?

"At first, when DRI organized the meetings, I did not attend. But my brothers and an uncle got me interested and I took the course and became involved in the project. Right now we have 22 members in the association. After being the treasurer I was elected the manager."

Cn: What problems have you had?

"We have had to struggle in order to obtain the credit we needed for production, because the department of Cesar is not in a DRI zone. Fortunately, CORFAS solved our problem and supplied the money."

Calixto de los Reyes is the manager of the COOAGROGAMIRPA cooperative which deals in cassava drying and the marketing of agricultural products.

Cn: Why are you also in marketing?

"The cassava drying season only lasts three to four months in the year. For the rest of the year the members could lose their enthusiasm and the cooperative could stagnate. That is why we have other activities. We have just signed a contract to sell 1800 liters of milk to another cooperative, COOLECHERA. Previously, we sold milk at very cheap prices to middlemen."

Calixto de los Reyes, Manager of COOAGROGAMIRPA, Gamirpa, Atlántico.

Hernando Moreno, Manager of COOPROALGA, Algarrobos, Córdoba.

Cn: How have you been doing?

"Contrary to other drying cooperatives, we started with few people—14 members—and we have grown to 22 members. We heard from DRI about the drying plants and asked them for information and advice. They introduced us to the project and CORFAS provided the credit for materials and working capital. We have already repaid the investment for the material, but we still owe for the working capital—which is not very much."

Hernando Moreno is the manager of the COOPROALGA cooperative formed by cassava producers in Algarrobos, Department of Córdoba.

Cn: What has been your experience with drying plants?

"We started our cooperative this year. We began drying cassava on the 22nd of January and stopped in April, when the rains began. Even though we are not drying cassava now, we have established the practice of getting together every two weeks to keep ourselves informed about what is happening."

Ismael Mendoza is the treasurer of COAPROBE, the first farmer association created in the north coast for operating the pilot cassava drying plant. They have just changed their designation from "association" to "cooperative".

Cn: Why did you change your name?

"Because an 'association' implies that it is not for profit and has limitations with respect to business operations. As an agroindustrial cooperative we have a better standing with banks and lending agencies."

Cn: How have you done?

"We have completed five years of operation—four as association and one as cooperative. We are actively dealing with agricultural products, especially with dry cassava and, on a minor scale, with maize and sesame. We have a tractor and agricultural machinery for use by members and for hire. We are also trying to expand our market by selling to animal feed manufacturers such as Purina." ■

Ismael Mendoza, Treasurer of COAPROBE, Betulia, Sucre.

CIAT cassava varieties to be released in the Philippines

The Technical Working Group for Root Crops of the Philippine Seedboard has nominated two cassava varieties for release. One variety, CM 323-52, developed from CIAT-introduced materials, was nominated according to standards set by the proponent agency, the Philippine Root Crop Research and Training Center (PRCRTC) at Visayas State College of Agriculture (ViSCA), Baybay, Leyte. This new variety, renamed VC 1, is now approved for release. The other approved variety, G 50-3, was developed by the University of the Philippines, at Los Baños (UPLB), College, Laguna.

The CM 323-52 (VC 1) variety was introduced to the Philippines through the Southeast Asian Regional Center for Agriculture (SEARCA) in 1979 with other varieties: CMC 40, CM 323-52, M Col 1684, CM 308-197, M Ptr 26, HMC 4, CM 305-38, CMC 84, CM 30, and CM 309-41.

The series of field evaluation conducted at PRCRTC showed that CM 323-52 has stable performance. In 1981, the results of two general location trials marked CM 323-52 as the highest yielder (Table 1). The 1982 farmers'-field trial, conducted under fertile soil conditions, resulted in yields as high as 41.6 tons/ha, whereas poor soil conditions yields were 22.8 tons/ha. The Philippine Seedboard's regional trial organized in 1983 involved several government agencies, the Bureau of Plant Industry of the Ministry of Agriculture and Food (BPI-MAF), PRCRTC at ViSCA, UPLB, and Southern Cotabato University (SCU). The entries in the regional trial were entered by PRCRTC and UPLB. After almost four years of regional testing of promising cassava varieties, the Technical Group selected CM 323-52 and G 50-3 from the pool of entries for recommendation and subsequent release. The CM 323-52 was found to have an average fresh root yield of 40.8 tons/ha (Table 2). It has a dry matter content of 36% with a medium hydrocyanic acid (HCN) level, brown root skin, white flesh color, moderately branching stems, and resistance to leaf spot.

Based on the nomination of the Technical Group, CM 323-52 (VC 1) can be grown in all regions of the Philippines. Its primary targets are the animal feed and starch industries and, in particular, the new cassava variety can now assist in the greater diversification of the National Root Crops Animal Feed Program.

In the meantime, the PRCRTC is mass-propagating the varieties for seed production which will be distributed to farmers and crop processors.

Table 1. **Performance of different, introduced, CIAT varieties in the fields of the Philippine Root Crop Research and Training Center (PRCRTC) and its cooperators.**

Entry	General yield trial (1981) (tons/ha)[a]	Farmers' field trial (1982)[b]	
		Fertile soil (t/ha)	Poor soil (t/ha)
CMC 323-52	32.2	41.6	22.8
CM 305-38	20.9	35.5	12.8
M PTR 26	23.1	32.9	-
CM 308-197	21.9	46.5	-
CM 84	14.3	32.7	-
HMC 4	17.6	32.7	-
CMC 40	21.2	36.5	16.9
M Col 1684	20.7	39.2	13.5
Golden Yellow (Check)	24.1	28.0	17.4
Kadabao (Check)		23.6	11.7

a. Average yield from two different locations at PRCRTC.
b. Conducted on farmers' fields with their direct involvement.

Table 2. **Yield data and other characteristics of cassava entered in the regional trials of the Philippine Seedboard, 1982-86[a].**

Entry	Dry root yield (ton/ha)	Fresh root yield[b] (ton/ha)	Root dry matter content[c] (%)	HCN[d]
Bogor	10.5	32.2 (7)	32.7	7
CMC 40	9.6	28.8 (7)	33.2	3
CMC 308-197	12.5	37.2 (6)	33.6	6
CMC 323-52	**14.7**	**40.8 (8)**	**36.0**	**7**
Datu 1 (Check)	13.9	40.2 (10)	34.7	9
Golden Yellow	9.8	26.7 (9)	36.9	3
G 50-3	**17.5**	**55.9 (6)**	**31.3**	**6**
Lakan 1	12.9	33.4 (6)	38.9	4
M Col 1684	12.1	34.6 (9)	34.9	9
M Ven 218	8.2	24.5 (7)	33.5	6
Vassourinha	10.9	30.4 (7)	36.1	7

a. Conducted in nine cooperating stations throughout the country.
b. Average yield based only on tests where the variety and the check were together. Only entries with 70% of plants established are included. The number in parentheses is the number of tests on which the mean was based.
c. Average for five locations only.
d. Based on the picrate test, using 1-9 scale: 1 = very low; 9 = very high.

The use of cassava stems and leaves as forage studied in Peru

The unharvested portion of many crop plants is discarded or destroyed because there is no apparent use for it. If these discarded parts could be put to use by the farmer, his labor would be more profitable.

The need to feed the world's increasing population generates problems in some countries such as Peru. In Peru there exists a food production imbalance because there are more people than the available cultivated area can sustain. The present government is trying to solve this problem.

There are various potential solutions to this problem. Among them is to expand, as much as possible, the agricultural area through irrigation and other methods and to increase the country's technical capacity. If, along with these general measures, means were found to fully utilize all parts of the crops grown, progress would be made toward solving food imbalance problems.

Peruvian scientists are studying the possibility of utilizing parts of the cassava plant that were previously considered useless such as the stems and leaves that are discarded when the roots are harvested. The research, based on previous studies, examines the use of stems and leaves in the nutrition of animals from an agronomic rather than zootechnical viewpoint.

The study was divided into three parts: first, the feasibility of utilizing the foliage of cassava plants for animal feed was considered, in particular as cattle feed for those tropical areas where cassava is traditionally grown. Second, the study measured the toxicity of fresh leaves which contain hydrocyanic acid (HCN), and prescribed a practical way for eliminating it, making the leaves edible for cattle. Finally, the nutritional value of cassava leaves was determined and compared with that of alfalfa.

More information can be obtained by writing to the Asociación de Agricultores, Los Cóndores 251, Urbanización San José, Callao 2, Peru.

Oswaldo C. Canessa

Update on the Peruvian cassava storage project

An article on *Shipping fresh cassava across the Andes: A race against time* was published in the last issue of the **Cassava newsletter** (Volume 10, No. 1). It recounted the preliminary field testing of cassava storage technology. The project was partly financed by the United States Agency for International Development (USAID).

Based on favorable results, a joint storage project has been launched by the Instituto Nacional de Desarrollo del Perú (INADE) and CIAT. The project will continue investigating the postharvest treatment of cassava destined for human consumption and aim to increase the sale and use, in the metropolitan Lima market, of fresh cassava roots grown in the Selva Central region. Within INADE, the Proyecto Especial Pichis Palcazu (PEPP) is responsible for executing the project. USAID is partially financing CIAT's role in the project (US$28,000).

The new project began in February 1986 and PEPP is now planning to start semi-commercial trials, to be terminated in March 1987 when the project will end. Carlos Nolte is the agricultural engineer supervising PEPP's role in the project.

Two top IITA management staff nominated for distinguished service award

Deputy Director General for Special Assignments, Dr. B. N. Okigbo, and the Director for International Cooperation and Training Program, Dr. E. R. Terry, of the International Institute of Tropical Agriculture (IITA) were recently nominated to be recipients of the International Society for Tropical Root Crops - Africa Branch (ISTRC-AB) Distinguished Service Award. The nominations and confirmation for the awards were made at the 3rd Triennial Symposium of the ISTRC-AB held in Owerri, Imo State, Nigeria, 18-22 August 1986.

The Award which has been given to only three other root crops researchers, is awarded to those individuals who significantly contribute to research and development in tropical root crops.

Dr. B. N. Okigbo is a foundation member and the immediate past President of the Society. His contributions to the understanding of the role of root crops in the farming systems of the humid and sub-humid tropics are well documented.

Dr. E. R. Terry, also a foundation member of the Society, was also, for the past six years, the Society's Editor-in-Chief. In this capacity Dr. Terry has had the responsibility as the Convener/Coordinator of the last three triennial symposiums of the Society.

Both Drs. Okigbo and Terry have contributed significantly toward the development of manpower for root crops research in Africa by training and encouraging young researchers.

Dr. S. K. Hahn, IITA's Director of the Root and Tuber Improvement Program, was one of the first recipients of this distinguished award and was presented with it at the recent meeting in Owerri.

The International Society for Tropical Root Crops - Africa Branch (ISTRC-AB) was created in 1978 to stimulate research, production, and utilization of root and tuber crops in Africa and ➡

adjacent islands. Its activities include the encouragement of training and extension, organization of workshops and symposiums, exchange of genetic materials, and facilitation of contacts between personnel working with root and tuber crops. The Society's headquarters are at IITA in Ibadan, Nigeria, but its executive council comprises eminent root and tuber researchers from national programs throughout the continent. ■

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