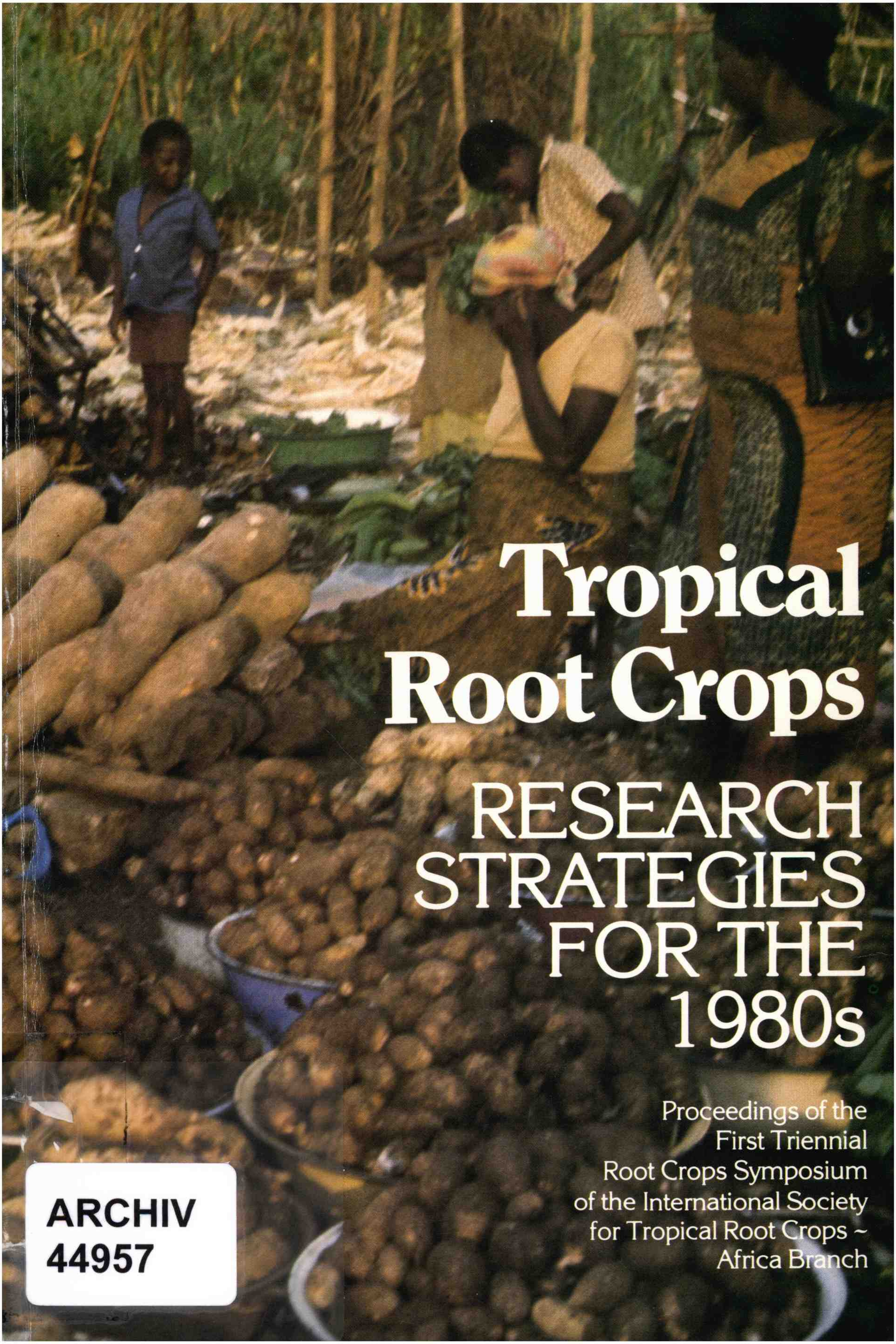

Tropical Root Crops

RESEARCH STRATEGIES FOR THE 1980s

Proceedings of the First Triennial Root Crops Symposium of the International Society for Tropical Root Crops ~ Africa Branch

IDRC-163e

TROPICAL ROOT CROPS: RESEARCH STRATEGIES FOR THE 1980S

PROCEEDINGS OF THE FIRST TRIENNIAL ROOT CROPS SYMPOSIUM OF THE INTERNATIONAL SOCIETY FOR TROPICAL ROOT CROPS — AFRICA BRANCH, 8–12 SEPTEMBER 1980, IBADAN, NIGERIA

EDITORS: E.R. TERRY, K.A. ODURO, AND F. CAVENESS

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are in Ottawa, Canada. Regional offices are located in Africa, Asia, Latin America, and the Middle East.

The International Society for Tropical Root Crops — Africa Branch was created in 1978 to stimulate research, production, and utilization of root and tuber crops in Africa and the adjacent islands. The activities include encouragement of training and extension, organization of workshops and symposia, exchange of genetic materials, and facilitation of contacts between personnel working with root and tuber crops. The Society's headquarters is at the International Institute of Tropical Agriculture in Ibadan, Nigeria, but its executive council comprises eminent root and tuber researchers from national programs throughout the continent.

Postal Address: Box 8500, Ottawa, Canada K1G 3H9
Head Office: 60 Queen Street, Ottawa

Terry, E.R.
Oduro, K.A.
Caveness, F.

International Society for Tropical Root Crops. Africa Branch, Ibadan NG

IDRC-163e

Tropical root crops: research strategies for the 1980s. Ottawa, Ont., IDRC, 1981. 279 p. : ill.

/IDRC publication/, /root crops/, /agricultural research/ — /plant breeding/, /plant diseases/, /cassava/, /sweet potatoes/ , /pests of plants/ , /plant production/ , /weed control/ , /intercropping/ , /harvesting/ , /crop yield/ , /conference report/ , /list of participants/ , /agricultural statistics/.

UDC: 633.4 (213)

ISBN: 0 88936 285 8

Microfiche edition available

Cooperating institutions

INTERNATIONAL INSTITUTE OF TROPICAL AGRICULTURE

INTERNATIONAL DEVELOPMENT RESEARCH CENTRE • CENTRE DE RECHERCHES POUR LE DÉVELOPPEMENT INTERNATIONAL

CANADA

NATIONAL ROOT CROPS RESEARCH INSTITUTE • UMUDIKE - UMUAHIA

CONTENTS

Improving the In-Situ Stem Support System for Yams

G.F. Wilson and K. Akapa

International Institute of Tropical Agriculture, Ibadan, Nigeria

In vast areas of the humid and subhumid tropics, yam vines are supported on the in-situ pruned or killed stems of shrubs or trees selectively retained at bush-fallow clearing. Under natural regeneration, the land is left fallow for 5 or more years before it is cleared and selected stems are used as yam support. With selected species such as *Leucaena leucocephala* and *Glyricidia sepuim*, in-situ stem supports are available in 1–2 years. Arranging support plants in rows allows for uniform yam fields instead of the haphazard arrangement associated with bush fallow. An intensive system based on a rotation of maize and yam within the support species is envisaged.

Dans une grande partie des tropiques humides et sub-humides, la tuteurisation des ignames est effectuée à l'aide de branches d'arbustes mortes ou de celles qui ont été gardées lors de la préparation des terres en jachères. Les terres sont généralement laissées au repos pendant cinq ans au plus et les tuteurs choisis sont le fruit de la régénération naturelle. Certaines espèces tel *Leucaena leucocephala* et *Glyricidia sepuim* peuvent en 1 ou 2 ans seulement servir de tuteurs sur place. En les plantant en rangées, les champs d'ignames seraient plus uniformes et moins désordonnés que ceux où la plantation est faite au hasard de la pousse des tuteurs. On envisage la culture intensive par rotation du maïs et de l'igname en fonction des tuteurs naturels.

The survival of yam as an important tropical staple remains in doubt mainly because the crop is labour-intensive and production costs are high (Campbell 1967; Coursey 1967b). Although nearly all aspects of yam production require high labour inputs, staking or providing support for the climbing vines is often singled out as a major hindrance to production expansion. In addition to its high labour demands, vine support calls for materials such as bamboo or small stems, which are often scarce and expensive. Yams grown without support yield significantly less than do supported ones (Coursey 1967b); yet over a large section of the yam-growing regions of West Africa, the world's leading yam-producing area, many farmers grow yams without support. The farmers are aware of the higher yield derived from supported vines, but most cite shortage of labour and scarcity of stakes as being responsible for the decline in the supporting of vines.

In the more humid regions, vine supporting remains a common practice. In these regions, weed control problems and leaf and stem disease associated with soil contact, in addition to reduced yields, are a major deterrent to supportless yam culture. In areas where staking is still common, the stakes are obtained from the bush fallow in which small trees and woody shrubs are the dominant plant types. However, high population densities and the demand for more food have increased the area under cultivation and have reduced both the area and the duration of bush fallow. Consequently, many areas no longer produce the stakes commonly used for yam vine support. Farmers must transport staking material, usually bamboo poles, many kilometres to their farms. The resulting increase in production cost is reflected in an increased price for yams, which may render them less competitive with other starchy staples and, eventually, lead to reduced yam production. This gloomy prognosis may be avoided if a suitable remedy is found for the staking problem.

Though the problem of staking has been a long-standing one, little has been done to provide alternatives or less-expensive yam vine support methods (Campbell 1967; Kennard and Morris 1956). We have, therefore, directed our efforts to the problems associated with providing support for yam vines and some possible solutions.

Vine Support Practices

Coursey (1967b) reviewed yam vine support practices, including use of:

- Trunks and stems of trees or shrubs in the bush fallow; these are usually pruned of leaves and killed or suppressed from early regrowth by being burned at the base. A stem may support more than one yam vine.

- Tall economic trees that have not been burned; the yam vines are led to them by strings attached 3–6 m up the tree and close to the base of the yam vine. One tree usually supports many yam vines.
- Stakes of bamboo or wood; stake thickness ranges from 2 to 10 cm, with bamboo commonly being in the upper range. Heights also vary but are seldom less than 2 m or more than 5 m. Again, bamboos are usually the taller stakes. Stakes are often strengthened against storm damage, 3–4 being tied together at the top or opposite stakes in parallel rows being tied and linked together by slim horizontal poles.
- Stem residues of crops, especially stiff sorghum stems; these are usually used as stakes in the savannas of West Africa and are often cut and stored during the dry season. They are usually tied together at the tops for extra strength.
- In-situ crop-stem residues, especially tall varieties of sorghum; depending on the rainfall pattern, yams are planted in ridges along the bases of the sorghum plants, often before the sorghum is harvested. The sorghum shades the yam ridges, keeping them cool during the dry season and eliminating the need for "capping" or mulching. When the yam sprouts at the start of the rains, the sorghum stems are bent at about 1 m aboveground and sometimes interwoven into low trellises that are fairly resistant to wind damage and usually persist through the yam growing period.
- Live crops, usually in mixed stands or intercropping systems; the crops include maize, sorghum, okra, pigeon pea, cotton, and castor bean. Because these crops compete with yams, the yield from yams supported in this manner is usually poor.
- Trellises, usually of wood and bamboo; these may be high or low, the latter being seen often in compound gardens in savannas or near cities where poles are scarce. The wooden or metal poles and wire trellises (Campbell 1967) used in experimental stations have not been adopted by farmers in West Africa.
- Mesh wire fences (Kennard and Morris 1956); these have been used successfully with steroid yams but may not be economic with food yams.

Importance of Yam Vine Support

Staking remains the most popular method for yam vine support (Coursey 1967b) and, in most locations, the most convenient. Except in areas where staking materials are not readily available, staking is also likely to be the least expensive method. Because of its popularity, staking has been the focus of most research on yam support.

Staking, or other support for that matter, elevates the weak vine, exposes a greater leaf area to insolation, and consequently encourages greater photosynthesis (Chapman 1965). The greater the leaf spread, the higher the yield expectancy; thus supports such as wire netting, which allows for greater leaf spread or higher leaf area index, give higher yields than staking does. Staked yam yields more than unsupported yams, and, perhaps, poor weed control in unsupported plots has influenced the results.

Farmers in humid areas generally believe that better yields are obtained by using taller stakes. Coursey (1967b), citing work from Ghana, contended that extra tall stakes had no special advantage. Yields did not increase significantly when stake height increased from 1.7 m to 3.6 m; however, response to stake height may depend on cultivar (Coursey 1967b).

The literature, though limited, indicates a positive response to staking or, more generally, vine support. However, the extra benefits are important only if support use is economic.

The Special Significance of Yam

To many West Africans, yam is not just a starchy staple but a religious and cultural symbol whose significance is not fully understood outside religious circles of the tribes concerned. It should be noted that the religious practices occur mostly in the humid forest where yams, other starchy roots and tubers, and plantain are the major food. In drier regions where cereals are important, no special religious significance is attached to yams even where they are a dominant crop.

There is very little information on the interrelationship between humans and crops in these areas, but the origin and distribution of the major crops in regions may be important. For example, in areas where yam has religious significance, it was, at times, the only crop from which storable food was available during the dry season. Perhaps, by guaranteeing the people's survival, it has been given special status. In such regions, it is also a symbol of wealth.

The yam's status explains why many people believe that increased costs of staking may mean an increased yam price but may not significantly affect production even in the presence of cheaper starch substitutes. It is unlikely that substitutes will ever replace yam as culinary, cultural, and religious objects in West Africa.

New Concepts in Staking

Among indigenous farmers, traditional yam supports are:

- In-situ stems from the bush fallow;
- In-situ stem residues of crops; and
- Stakes.

Investigations aimed at developing improved and inexpensive supports are directed toward the basic principles of these supports because of their popularity. Based on the in-situ stems from bush fallow, an in-situ support system was developed at IITA. At 1.5 × 1.0 m spacings the in-situ stems gave a lower yield (17 t/ha) than did conventional staking at 1.0 × 1.0 m spacings (26 t/ha), even though the emergence (70%) was slightly higher with in-situ stems (70% compared with 64%). No difference was observed when spacings were identical; at 1.5 × 1.0 m spacings, the yield for yams staked with in-situ stems was 20.7 t/ha and, for those on conventional stakes, was 20.6 t/ha. The major advantage was that suitable support stems were produced in a shorter time than they are produced by bush fallow. The shrub *Leucaena leucocephala* produced suitable support stems in 1–2 years, a relatively short period compared with the 5–7 years for naturally regenerated shrubs and trees in the bush fallow.

Leucaena leucocephala was also used in two other methods: as conventional stakes and as horizontal support. In the latter, the tops and smaller branches were thrown on the ground and the vines grew over them. In this method, stems too short for conventional stakes supported the vines and exposed larger leaf areas to sunlight. Yields from this method were not significantly different from those from crops grown with conventional stakes (1.61 tubers/hill and 25.5 t/ha compared with 1.44 and 25.9 for conventional stakes).

These systems should have impact in areas where population pressure has reduced the bush fallow to periods shorter than required for development of stems suitable for stakes. With suitable species, stakes could be produced on marginal land not suitable for crops. Trials in progress indicate that more than 20 000 stakes annually are obtainable from a single planting of *Leucaena leucocephala*. These quantities were obtained over a 3-year period from plots that have not yet shown signs of decline.

Conclusion

The problem of supporting yam vines may be solved by production of stakes from fast-growing shrubs. The stakes produced would be used in situ as is the practice in the traditional system of growing yams after bush fallow or cut and used as conventional stakes. If made into conventional stakes, the shrubs could be grown on marginal land in close proximity to yam fields. Properly developed, these systems offer inexpensive stakes and, thus, lower yam production costs.