

Problems of Frafra potato production in Ghana

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SUMMARY

A survey of the production of Frafra potato (*Solenostemum rotundifolius* Poir) in Ghana was conducted to collect baseline data on the crop and to identify constraints to production. In all, 100 farmers who were randomly selected from 16 villages and towns in five districts in the Upper East Region and Upper West Region were interviewed between August and November 1991. Results indicated that Frafra potato is an important crop in the districts of Builsa, Kassena-Nankani, Frafra, Lawra-Nandom, Jirapa-Lambussie, Nandawli, and Wa. It is usually cultivated as a monocrop but may sometimes be intercropped with yam, okro, maize, rice, sorghum, cowpea and bambara groundnut. It is usually grown on mounds and sometimes on ridges but not on the flat. Tubers are mostly used for propagation but softwood stem cuttings can also be used. Farm sizes range between 0.05 and 1.2 h. A wild type referred to as "Tug-piece", meaning shrub potato, has been identified by farmers. Constraints to production, in descending order of importance, include rapid tuber deterioration in storage, lack of adequate planting materials, pests and diseases, and insufficient soil moisture for maturing the crop.

Original scientific paper. Received 9 Jan 97; revised 25 Aug 97.

Introduction

Frafra potato [*Solenostemum rotundifolius* (Poir)] belongs to the family Labiatae and genus *Coleus*. The plant is known by different scientific names: *Coleus rotundifolius* (Coursey & Booth, 1977), *Coleus parviflorus* (Benth) (IAEA, 1990), *Plectranthus esculentus* N.E. Br., *Coleus esculentus*, *Coleus dazo* (Purseglove, 1968), and *Solenostemum rotundifolius* (Poir) (Abbiw, 1990) or *Coleus dysentericus* (Baker) (Wills, 1962). It is also known by several common names

RÉSUMÉ

TETTEH, J. P. & GUO, J. I.: *Les problèmes de production de patate de Frafra au Ghana.* Un levé de la production de patate de Frafra (*Solenostemum rotundifolius* Poir) au Ghana s'est déroulé pour recueillir les données de base sur la culture pour identifier les contraintes à la production. En tout, 100 cultivateurs qui étaient sélectionnés par hasard en 16 villages et villes en 5 districts dans la haute région de l'est et la haute région de l'ouest, étaient interviewés entre Août et Novembre 1991. Les résultats indiquaient que la patate de Frafra est une culture très importante dans les districts de Builsa, Kassena-Nankani, Frafra, Lawra-Nandom, Jirapa-Lambussie, Nandawli et Wa. Il est d'habitude cultivé en tant qu'une monoculture mais peut être quelquefois interplanté avec l'igname, le gombo, le maïs, le riz, le sorgho, la dolique et l'arachide de bambara. Il est d'habitude cultivé sur les levées de terre et quelquefois sur les billons mais pas sur le plat. Les tubercules sont souvent utilisés pour la propagation mais les boutures de tige du bois tendre aussi peuvent être utilisées. Les étendues des champs s'étendent entre 0.05 et 1.2 h. Un type sauvage, référé comme "tug-piece" significatif la patate d'arbrisseau, a été identifié par les cultivateurs. Les contraintes à la production, par ordre d'importance décroissante, comportent, le détérioration rapide de tubercule en stockage, le manque de matériels adéquats pour la plantation, les ravageurs et les maladies, et l'insuffisance d'humidité du sol pour la maturation de la culture.

such as Sudan potato, Madagascar potato, Livingstone potato, Hausa potato, Salaga potato (Abbiw, 1990), Kaffir potato, Country potato and *Coleus* potato.

Frafra potato is a herbaceous plant with prostrate growth habit. It produces a cluster of edible small tubers at the base and at points along the stem and branches that touch the ground. The tubers are round or oval in shape.

Frafra potato is grown extensively in the interior savanna areas of Ghana, Nigeria, Mali and

Burkina Faso, in areas where there is adequate moisture supply. In Ghana, the crop is cultivated in the Builsa, Kassena-Nankani, Frafra, Lawra-Nandom, Jirapa-Lambussie, Nandawli, and Wa districts of the Upper East and Upper West Regions.

Frafra potato is one of the minor but essential food crops in the production areas. Nutritionally, the tuber is a carbohydrate food, but it is also fairly rich in protein (1.9 g/100 g). Compared with sweet potato (0.8 g/100 g), yam (1.8 g/100 g) and cassava (0.7 g/100 g), Frafra potato thus ranks highest in protein content among the tuber crops grown in Ghana (GGAP, 1977). Besides its nutritional value, Frafra potato plays an essential role in the social lives of the people in the districts where it is grown. It is believed that one can stay for a long time without food after a meal of Frafra potato. For that matter, it is the favourite dish served to hunters, or persons engaged in strenuous activities which demand that they stay off food for long periods of time. The amount of Frafra potato a person can serve to his guests at gatherings determines his social status, and the respect accorded him by the community.

In spite of the importance of the crop in the culture of the people in the above-mentioned districts, its production appears to be declining. There is, therefore, the need for a critical study of the crop to identify its deeper cultural and economic importance to the people, and the contributing factors to its declining production.

On the basis of the above, a study was carried out to ascertain the present situation of Frafra potato production so as to identify production constraints as well as to obtain baseline data on ecological requirements, cultural practices, and the cultural significance of the crop in the growing areas.

Materials and methods

A survey of the production of Frafra potato was conducted at Lawra-Nandom, Jirapa-Lambussie and Nandawli districts in the Upper West Region and at Builsa and Kassena-Nankani districts of

the Upper East Regions using a content validated questionnaire. The questionnaire was administered by six enumerators to 100 Frafra potato farmers sampled at random from 16 towns and villages in the target districts from August to November 1991. The age group of respondents ranged between 20 and 80 years. Additional information was gathered through informal discussions with the farmers and by personal observations of the crop in some fields.

Results and discussion

Age distribution of Frafra potato farmers

The age group of respondents ranged from 20 to about 80 years, with 64 per cent falling within the 40-80 years age range. This indicates that the aged cherish or appreciate the importance of the crop more than the youth. This trend may be explained by the fact that the crop has certain cultural values, as the aged are more interested in the observance or preservation of tradition. Unless the nutritive value of the crop is highlighted so as to increase demand and consumption among the youth, the decline in production will continue as the aged die.

Of the 100 farmers interviewed, 71 per cent grow Frafra potato every year, while 29 per cent grow it only occasionally. This may indicate that the crop, though essential, has a staple substitute; hence, some farmers can afford not to grow it in some years and still survive.

The farm sizes were small. About 13 per cent of farmers cultivated between 0.05 and 0.08 ha per farmer, 81 per cent of farmers cultivated between 0.1 and 0.4 ha, while 6 per cent of farmers claimed to cultivate between 0.8 and 1.2 ha per farmer in a year.

Some farmers relate farm sizes to the fact that the crop is not a major staple. The operations on the major staples are attended to first. The result is that by the time the farmer shifts attention to the crop, the season is so far advanced that the farmer can only cultivate a small area. Alternatively, small farm sizes may also be attributed to the age of the farmers (40-80 years) who cultivate the crop. The

use of hired labour is not a common feature in the growing areas. Farmers, therefore, manage their farms themselves. The production of Frafra potato is highly labour-intensive; hence, the aged farmers can manage only small holdings at a time. The delay in planting also invariably leads to yield reduction because of very limited soil moisture to mature the crop.

Seed bed preparation

The crop is usually grown on mounds. Results showed that about 87 per cent of farmers cultivated it on mounds, 13 per cent on ridges, and none on the flat. Mound-making is tedious and labour-intensive, and severely limits farm sizes. Ridging, on the other hand, can be mechanized, or made by use of animal traction. There is the need to encourage more farmers to grow the crop on ridges rather than on mounds to reduce drudgery.

Cropping system

About 61 per cent of farmers contacted cultivated Frafra potato as a monocrop, while the rest intercropped with various crops. Among the crops intercropped with Frafra potato are yam, okro, maize, rice, sorghum, cassava, cowpea, millet and bambara groundnut (Table 1). The choice of the intercrop depends on the locality. In areas where yam is grown, most farmers prefer to use it as the intercrop for Frafra potato because both crops are grown on the same mound and this cuts down on the cost of preparing the seed bed. In such a

combination, however, the Frafra potato is disadvantaged. Because of its relatively smaller biomass and growth rate, it is completely shaded by the yam.

Intercropping Frafra potato with okro is popular, with 24 per cent of farmers practising it. This type of crop combination may not be agronomically advisable because farmers claim that both crops are hosts to common beetles and caterpillars which feed on their leaves. There is the need for further investigations to identify the specific pests involved as well as compatible crops for use in the Frafra potato intercrop.

Pests and diseases

Other pests mentioned by about 80 per cent of farmers included grasshoppers, crickets, termites, centipedes, millipedes, stem borers, potato weevil and rodents. However, the relative frequency of their occurrence and the extent of damage caused by them is unknown. A few farmers claimed to apply wood ash to the leaves to control insect pests; otherwise, no protective measures were taken. Those who do not take any measures claim that the pests do not have any significant effect on the crop. There is the need for further investigations to identify the specific insect pests that attack the crop and the extent of damage caused by them.

Only 39 per cent of farmers observed diseases on their crop. These include tuber rot, root knot, leaf curl, stunted or rosette growth, tuber mottling and scab. The incidence of root knot caused by the root knot nematode became evident in a trial at the University of Cape Coast School Farm in 1992 (unpublished).

Tools

The major tool used for production is the hoe. Three types of hoes, classified on the basis of blade size, are used: There are the large (30 cm) hoe for making mounds, the medium size (15-20 cm) hoe for weeding; and the small size hoe with a narrow blade (5-10 cm) for planting.

TABLE 1

Frafra Potato Intercrop

<i>Intercrop</i>	<i>Percentage of farmers</i>
Yam	30
Okro	24
Maize	17
Rice	6
Sorghum	6
Others*	17

*Others include cowpea, millet, cassava, sesame and bambara groundnut.

Days to mature

The majority of farmers (55 per cent) indicated that Frafra potato matured in 5 to 6 months after planting, while 30 per cent of farmers gave 3 to 4 months, and 15 per cent indicated that 6 or more months were required for maturity. Irvine (1969) recorded that the crop matured in 5 to 6 months, thus agreeing with the observations of majority of farmers.

Importance

The crop is cultivated for both domestic consumption and sale. Thirty per cent of the respondents cultivated it exclusively for home consumption while 70 per cent of them cultivated it partly for home consumption and partly for sale. With regard to its cultural significance, 87 per cent of the respondents claimed that the crop had no cultural or religious significance, while 13 per cent indicated that it had medicinal properties in addition to its cultural and religious significance. The following reasons were given to buttress their claims:

- (i) It is offered as a special gift to mothers-in-law.
- (ii) It is the commonest dish supplied at funerals.
- (iii) It is used for rituals during the out-dooring of twins.
- (iv) The leaves are used as a herb for the treatment of urinary infections (blood in urine).
- (v) It is the main dish consumed by hunters who go on long hunting expeditions.

Constraints to production

Table 2 shows the problems associated with Frafra potato production as listed by the farmers. Erratic rainfall, poor storability, and pests and diseases topped the list.

Rainfall

About 73 per cent of the farmers complained about poor rainfall distribution. They explained that often the rainy season ended abruptly during

TABLE 2

Constraints to Frafra Potato Production

Problem	Percent of farmers
Rainfall	73
Storage	33
Pests and diseases	30
Lack of planting materials	22
Tools not very effective	18
Labour-intensive	12
Others*	6

*Others include lack of suitable land, fertilizer and marketing problems.

tuberization and that affected the number and sizes of tubers formed. Other years, there was too much soil moisture, a situation which encouraged branched or forked tubers which were rejected by buyers. Tindall (1983) has also reported that the crop is sensitive to waterlogging which results in irregular tuber formation and reduced yields.

The problem of inadequate soil moisture for plant growth is due to late planting. Farmers plant Frafra potato after most other crops have been planted and when the season is far spent. Irvine (1969) indicated that the late planting of Frafra potato often resulted in very poor yields.

Storage

Farmers also complained about poor storability of tubers as an important constraint to production. Farmers need to store their produce for up to 8 months to be used as food or as seed for the next cropping season. Tubers are often stored in pots or baskets or in sand. The baskets of tubers are usually hung on the branches in the open to ensure adequate ventilation. No matter the method of storage practised, there are high losses especially under bulk storage. Farmers claim that they avert storage losses by selling out most of their produce even at a loss at harvest time and store only a small quantity for later household consumption and for seed.

Storage in sand or in the ground was observed by farmers to promote too early sprouting of tubers prior to the period for planting the new crop.

Tindall (1983) suggested that tubers can be successfully stored by packing them in dry sand under cool-shaded conditions. Processing for storage in the dehydrated form may be considered for tubers meant for consumption. The lack of appropriate facilities for bulk storage is a disincentive for farmers who want to expand their farms.

Planting materials

Inadequate supply of planting materials is also a constraint to production. It is estimated that about 1,100 kg of tubers are required to plant 1 ha. This may seriously reduce ware tubers. Most farmers underestimate their planting material needs and consume most of the produce. In times of food deficit also, farmers are compelled to consume the seed. These problems, coupled with high storage losses, result in acute shortage of seed for planting. Frafra potato can be effectively propagated by stem cuttings. However, farmers do not use stem cuttings for propagation. This may be due to the following:

- (i) Extra labour and time would be required to nurse and transplant stem cuttings to the field.
- (ii) By the time the nursery plants produce enough vegetative material that can be used as stem cuttings, the season may be half gone, and the transplants will not be matured for tuberization before the dry season sets in.

The technique of using stem cuttings would have to be investigated, refined and proved to be cost-effective before it can be adopted by farmers.

Production trend

About 47 per cent of farmers interviewed indicated that production of the crop increased whilst 53 per cent considered production to be on the decline. There were no statistical data on production to support any of the opinions. Table 3 shows the reasons given by the farmers for the suspected production trends.

The reasons given for the suspected increase in production include the increase in population and its attendant increase in the consumption of the crop; hence, there is a viable market for it.

TABLE 3

Reasons Advanced for the Suspected Trends in Frafra Potato Production

<i>Increase/Decline</i>	<i>Percent of farmers</i>
<i>Increase</i>	
Expansion in the consuming public	27
Good market for crop	26
More farmers cultivate it	17
Fits into existing rainfall pattern	8
Yields fairly well even with little rains	5
High yielding	2
High nutritive value	1
<i>Decline</i>	
Precarious or erratic rainfall	47
Destruction by pigs	21
Decline in production of the intercrop	20
Decreasing suitable land for cropping	7
Poor soil fertility	5
Others*	17

* Others include low consumption, poor storability, taboos, availability of more appropriate substitutes such as yam and cassava.

Some consumers complain that the sizes of the tubers are too small. The tubers are therefore boiled whole, and the skins are removed just before eating. The process of removing the skin involves the use of both hands which get dirty. If the sizes of the tubers could be increased so that peeling prior to boiling is possible, the crop would be more attractive to the affluent as well. Some crop improvement strategies meant to increase the sizes of tubers need to be pursued.

About 96 per cent of the respondents advocated the promotion of the crop through research and extension, for the following reasons: about 43 per cent of farmers said Frafra potato serves as a convenient substitute for the popular staple foods; 26 per cent said more people now consume it; 23 per cent said it is more drought tolerant than other staple crops grown in the area; 19 per cent

said there is a good domestic market for it; and 7 per cent said it can be processed by dehydration, and stored for a long time.

Farmer observations about Frafra potato

Ecology

The crop requires well-drained loamy soil with moderate fertility. High levels of organic manure in the soil encourage excessive vegetative growth at the expense of tubers. The crop is sensitive to heavy shading under which tubers grow large but do not cook well. Waterlogged conditions lead to the production of branched or forked tubers with rough skin and low food value. Inadequate rainfall or late planting leads to poor yields.

Planting materials

The crop flowers profusely but sets no seeds. Vegetative propagation is, therefore, necessary. Both tubers and stem cuttings can be used as planting materials. Smaller tubers are preferred to larger ones for planting. Some storage time is essential for tubers to break dormancy before they can sprout. A tuber must sprout in storage before it is planted. During planting, care must be taken not to bruise or break the sprout because it takes a long time for a new sprout to develop in replacement. Any part of the tuber can sprout but usually the sprout comes from its proximal end. Deep planting of tubers should be avoided. Where the tuber has already sprouted before planting, the growing tip of the shoot must not be buried. Deep sowing or burial of shoot tip delays initial growth and establishment of the crop.

Soft wood stem cuttings can also be used for propagation but the method is not practised by farmers. It was, however, observed that stem-propagated plants produce larger but fewer tubers than tuber-propagated plants. This observation by farmers contradicts that of Irvine (1969) who indicated that stem-propagated crops give lower yields than tuber-propagated ones. Tindall (1983) explained that stem cuttings are difficult to root and this may contribute to the lower yields.

Varieties

On the basis of tuber shape and skin colour, four types of Frafra potato are identifiable as follows: the red, white, short tuber, and slender tuber types. The red type is said to give the highest yields.

Only 6 per cent of the respondents claimed that the cultivated Frafra potato also grows in the wild. About 47 per cent of the respondents, however, indicated that there is a wild plant known as "Tug-piece" (which means shrub potato in the Dagaare language) that closely resembles the cultivated crop in stem, leaf and tuber characteristics as well as aroma. Some farmers claimed that the tubers of "Tug-piece" are edible, but others said that they are inedible. Most farmers believe, however, that "Tug-piece" can be easily domesticated or converted to Frafra potato if it is cultivated for a number of generations.

Conclusion

Frafra potato is an important staple food which is of social and cultural significance in the Upper East and Upper West Regions of Ghana where it is extensively cultivated. It may be grown as a monocrop or intercropped with yam, okro, maize, rice and sorghum.

Farms are generally small, ranging in size from 0.05 to 1.2 ha per farmer. It is mainly grown on mounds and sometimes on ridges but never on the flat. An uncultivated type called "Tug-piece" does exist in the wild.

It is usually grown from tubers. Although propagation by stem cuttings is possible, it is not practised by the indigenous farmers.

Major constraints to production include erratic rainfall, poor tuber storability, inadequate planting materials, and high incidence of pests and diseases.

Recommendations

Any effort to assess the prospects and to alleviate the problems associated with production and utilization of Frafra potato would require that further research be undertaken in the following

areas:

- (i) Germplasm collection, characterization, and evaluation.
- (ii) Crop response to nutrient application.
- (iii) Date of planting.
- (iv) Intercropping.
- (v) Use of stem cuttings as planting materials.
- (vi) Storage of seed tubers.
- (vii) Processing and storage of ware tubers.
- (viii) Pests and diseases.
- (ix) Improvement in the size of tubers.
- (x) Economics of growing Frafra potato.

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