Yam Production in the Derived Coastal Savanna Zone of Ghana- Past, Present and Future Prospects

E. Otoo[1†], R. Asiedu[2], S. A. Ennin[1] and E. O. Ekpe[3]
[1]Crops Research Institute, P. O. Box 3785, Kumasi, Ghana.
[2]International Institute of Tropical Agriculture, PMB 5320, Oyo Road, Ibadan, Nigeria.
[3]Department of Crop Science, University of Uyo, Uyo, Nigeria.
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Resumé
Otoo, E., Asiedu, R., Ennin, S. A. & Ekpe, E. O. *La production de l'igname dans la zone dérivée de la savane côtière du Ghana - Les perspectives du passé, du présent et de l' avenir.* Jadis, la zone dérivée de la savane côtière était associée à la production de l'igname. Pourtant, aujourd' hui, il y a une chutte dans la production de l'igname dans la zone. L'objectif de ce dossier était d' examiner la production de l'igname dans le passé ainsi que le présent dans la zone et puis conduire une analyse économique de la production de l'igname et pronostiquer l' avenir de la production de l'igname dans la zone. Avec l'aide des outils formels et informels d'enquêtes ainsi que les apprôches selectionnelles participatoires du paysan, on a généré les données primaires et sécondaires sur le passé et le présent pour la production de l'igname. Les données sécondaires sur les paramètres climatiques et édaphiques étaient examinées pour sa convenabilité de la production de l' igname. Les résultats des études ont montré que les facteurs climatiques et édaphiques favorisent toujours la production de l' igname. Dûe à la nature des sols, la culture de l' igname est considérablement différenté de la culture de l'igname dans les autres agro-écologies. Les cultivateurs de l'igname creusent excessivement le plant de l'igname surtout les variétés *D. rotundata* pour augmenter la pénétration dans le sol par la tubercule et puis faciliter la formation d'une bonne tubercule résultant aux rendements élevés. Les contraintes à la production de l'igname étaient identifiées et classifiées. Les perspectives de l'avenir pour la production de l'igname dans la DCSZ étaient discutées et des mésures pour mitiger les défis de cette entrerprise sont recommandées.

Mots clés: La zone dérivée de la savane côtiérè, le Ghana, l'igname.

Abstract
The derived coastal savanna zone (DCSZ) of Ghana, was synonymous with yam production in times past. However, yam production in the area has declined in recent times. The objective of this paper was to examine past and present yam production in the zone, conduct an economic analysis of yam production and prognosticate the future of yam production in the zone. Using formal and informal survey tools and farmer participatory breeding approaches, primary and secondary data were generated on past and present yam production.

[†]*Corresponding author*

Secondary data on climatic and edaphic parameters were assessed for its suitability for yam production. Results of the study showed that the climatic and edaphic factors still favour yam production. Due to the nature of the soils, yam cultivation is significantly different from yam cultivation in the other agroecologies. Yam farmers under-dig the yam plant especially *D. rotundata* varieties to enhance soil penetration by the tuber and facilitate good tuber formation resulting in high yields. The constraints to yam production were identified and ranked. The future prospects for yam production in the DCSZ are discussed and measures to mitigate the challenges to this enterprise are recommended.

Keywords: Derived coastal savanna, Ghana, yam.

Introduction

Agriculture is the mainstay of the Ghanaian economy; it employs 66% of the workforce and is responsible for 50% of the GDP of the country (ICRA,1996). Root and tuber crops in general contribute as much as 46% of the Agricultural Gross Domestic Product (AGDP), with yam contributing 16% (NARSP, 1994), same as cocoa (ICRA, 1996). However, it is estimated that agriculture operates at only 20% of its potential (UKT&I, 2005). Under the Ghana Poverty Reduction Strategy (GPRS), the agriculture sector is expected to play a progressive role. If the stated objectives are to be achieved then Ghana must witness a significant leap in its agricultural productivity in all sectors. No aspect of its agricultural resource must be left untapped especially, yam production, which the country leads the world, (GYPEA, 2000). A legislative instrument has reclassified yams as a Traditional Export Commodity instead of the non-Traditional Export Commodity (GRi, 2003).

The derived coastal savanna zone of Ghana loosely referred to as "Bodwease" was once synonymous with the production of high quality white and yellow yams. Currently, yam production is on the decline even though the environmental factors still favour its production.

The general objectives of this study were to:

Examine past and present yam production in the derived coastal savanna zone of Ghana;

Compare the economics of yam production in the derived coastal savanna zone of Ghana to that in the forest/savanna transition and the forest zones; and

Assess the future prospects for yam production in Derived Coastal Savanna zone of Ghana.

The specific objectives were to:

Develop baseline information for improvement of yam in the study area;

Document farmer's yam production practices; and

Assess the profitability of yam

cultivation in the study area.

Materials and methods

Data on the past yam production in the study area, were obtained from two sources: secondary data were from annual reports, quarterly bulletin and project briefs of planning and executing agencies operating in the study area; and also generated using informal survey tools such as rapid rural appraisal. Oral history was recounted by selected number of farmers (35) who are all over 30 years and had more than 20 years experience in yam cultivation. Some verification was sought at 10 farmer field days which were conducted as a component of yam improvement programme using the farmer participatory breeding exercise.

On the current state of yam production in the zone, primary data were generated by semi-structured interviews (SSI) using informal survey methods like rapid rural appraisal (RRA) and participatory rural appraisal (PRA) tools. Based on the results from the study a formal survey was conducted with a questionnaire administered to 50 yam farmers to obtain information on the socio-economic characteristics, types grown, farming systems and socio-economic factors influencing yam cultivation. This was supplemented by secondary data from Ghana Living Standards Survey 4.

Yield data used were obtained from multi-location evaluation of 80 *Dioscorea rotundata* genotypes in 3 agroecologies in 4 years using an Augmented RCB design with 3 blocks. Data on soil and climatic conditions were obtained from secondary sources. Data on pricing were also obtained through informal discussions with farmers, market women and agricultural extension agents.

Data analyses

Quantitative data were analysed using PROC MIXED procedure of SAS (1999) software and qualitative data with SPSS Version 10.

Results and Discussions

Out of the 50 farmers surveyed; 76% were males and 24% females. Seventy-five per cent of the farmers were above 30 years and the rest less than 30 years old (Table 1). Only 20% were part-time farmers. All the farmers had more than 5 years experience in yam cultivation, with 75% actually having more than 20 years experience in yam cultivation. All the farmers intercrop yams with other crops. None of the farmers cultivate yam only (Table 2).

The ecology of the country can generally be classified into five well-defined agro-ecologies - Sudan savanna, guinea savanna, forest-savanna transition, forest, and coastal savanna zones (Fig. 1). The coastal savanna zone is low-lying and covers about 16,000 km^2 or about seven per cent of the total

Table 1. Age, farming experience and educational background of respondents.

Gender	% *Interviewed* (n=50)	*Age (years)* >20	21-30	31-40	>40	*Farming experience (years)* 1-10	11-20	21-30	*Educational background* NIL	PRIMARY	MSLC	JSS	GCE "O/L"	Above GCE
Male	76	1	4	27	6	1-2	8	25	5	7	23	1	1	1
Female	24	0	4	7	1	6	6	0	10	1	1	0	0	0
Total	**100**	**1**	**8**	**34**	**7**	**11**	**15**	**8**	**15**	**8**	**24**	**1**	**1**	**1**

Table 2. Some characteristics of yam cultivation in the derived coastal savanna.

Gender	*Scale of operation (hectares)* 1-2	>2	*Farming system* *Sole*	*Mixed*	*Types of yams grown* *D. rotundata*	*D. cayenensis*	*D. alata*	*Other*
Male	15	85	0	100	100	100	13.2	7.9
Female	90	10	0	100	100	100	100	0
Total	**105**	**95**	**0**	**200**	-	-	-	**7.9**

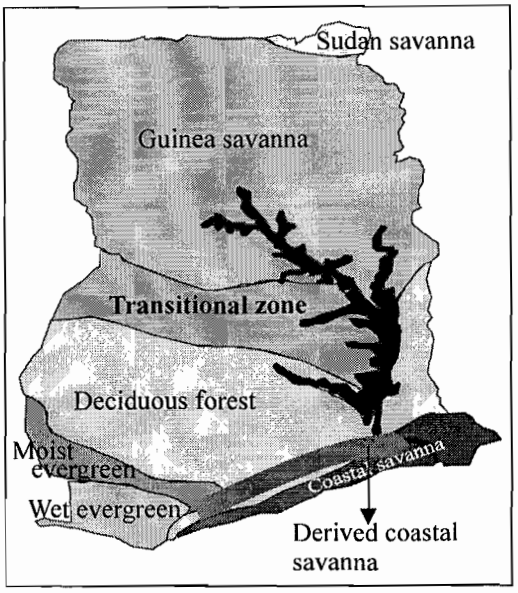

Fig. 1. Agro-ecological zones of Ghana.
Source: Map-Zone, 2004.

area of Ghana. Lying between the deciduous forest and the coastal savanna, a small strip of land extending into the forest zone where yam cultivation is suitable that is being referred to as derived coastal savanna this may be used interchangeable with "Bodwease".

The derived coastal savanna zone

The area has a bi-modal rainfall pattern with the major season starting from early March-April and ending in July-August and the minor season from mid-August-September ending to mid-November. The terrain is undulating with some exposed rocks. It has near optimum conditions for yam cultivation with respect to soil and climatic conditions.

Soil

Soil requirements for yams range from deep sandy loams (Kay, 1973) to deep loam soils (Kassam, 1976). Performance of yam is also affected by the morphological properties of the soil (Orkwor and Asadu, 1997). The three most important soil properties for yam cultivation are friability, depth and drainage (Norman *et al.*, 1995), especially friability since unlike other root crops such as cassava which initially penetrate the soil with relatively thin roots which expand later, the yam tuber penetrates the soil as it expands (Onwueme, 1978). Soils of the derived coastal savanna zone are predominantly Haplic lixisol (FAO UNESCO classes) with a slope of 0-3% (Asiamah and Adu, 1992). Locally, the soils are classified as "Bodwease" series and have 10cm thick top layer of dark reddish brown, humus, sandy clay loam; frequent fine rootlets; crumbly; porous; firm with pH of 7.7. (Asiamah and Adu, 1992).

Climate

Yams require rainfall for at least 5 out of 8 months of growth in the field (Orkwor and Asadu, 1997). Yams grow better at areas with annual rainfall range of 1000-1500 mm and well distributed over a 6-7months of the cropping season (Onwueme, 1975; Ferguson and Gumbs, 1976). The distribution of the rainfall is however, more important than the volume (Orkwor and Asadu, 1997).

A temperature range of 25-30°C during the period of maximum potential growth (14-20 weeks after planting) is considered a near optimum range for yam production (Norman *et al.*, 1995). Climatically, the derived coastal savanna zone has a temperature range of 21-34°C; a bimodal rainfall pattern, March-July with peak in June, September-November with peak in October; rainfall range 1050-1200mm, averaging 800mm per year, hence a very suitable environment for yam production. This confirms why the area had remarkable yam production record.

Responses from farmers

Age, farming experience and educational background

Yam farmers interviewed were fairly old, fairly educated but highly experienced in yam cultivation. Eighty-two per cent of the farmers were over 30 years and 78% had more than 10 years experience in yam cultivation (Table 1). Most of both the men and women were between 30 and 40 years. There was only one farmer who was less than 20 years. Most of the farmers had some form of formal education, with most of the men having Middle School Leaving Certificate (MSLC). Most of the women (83.3%) were not literate.

Farming systems, farm size and types of yams cultivated

The major crops grown in this area in the order of importance are cassava, maize, yam, plantain and tiger nuts. This is on subsistence basis. Generally these crops are intercropped with yams and or cassava as a base crop in the intercropping system. Commercially, pineapple, papaya and citrus are the crops of importance and often grown as sole crops. None of the respondents cultivate yam solely. Yams grown in this area are mostly *Dioscorea rotundata, D. cayenensis, Dioscorea alata, D. praehensilis* and *D. bulbifera* are planted on a minor scale (Table 2). Most of the farmers interviewed (84% of respondents) grow all the three main species of yams with 16% growing only *D. rotundata* and *D. cayenensis* and only two farmers growing *D. praehensilis* and *D. bulbifera*. They often cultivate them in mixtures and none of the farmers cultivated *D. alata* alone. Gender differences were also observed in quantity of yam species cultivated. Most of the men had yam farm size of >2 ha, with most of the women (90%), having 1-2 ha of yam fields (Table 2). Again, all the women respondents cultivated more of *D. alata* (1-2 acres) than the men (>1 acre; the acreages expressed in terms of number of mounds). This could be attributed to the men being more commercially oriented than the women. All the women cultivating *D. alata* gave food security as the main reason for cultivating and the men cited low market value as the main disincentive for cultivating *D. alata*.

Yam field sizes ranged from as low as 1 acre to as high as 10 acres, with 50-62%

being *D. rotundata*, 34-37% *D. cayenensis* and 1-16% *D. alata*. The *D. rotundata* varieties "*Maale*"," *Brass*", "*Kasante*","*Ayiaku*", and "*Ntonto*" were the most important cultivars grown. These are varieties with unique characteristics (Table 3). The most preferred yams are the white yam and the varieties in the order of preference are: "*Maale*", "*Brass*", "*Kasante*", "*Ntonto*", "*Ayiaku*". Some varieties such as "*Deko*", "*Potourokote*", and "*Kwame Anum*" are now almost extinct and were marginally cultivated by three respondents (6%, n=50). Prestige and diversity were the main reasons given for maintaining all these cultivars. "*Matches*", "*Puka*", "*Afaase maale*", "*Odiiamakuraba*", "*Ewuruku Tuntum*", "*Fawotsirkosie*" or "*Bayernanka*" and "*Osowaba*", are only but a few of the *D. alata* varieties being grown presently. Most of the respondents who cultivate *D. alata* limit their varietal pool to only "Matches" and "Puka". Only one of the respondents was cultivating all the listed *D. alata* cultivars. The derived coastal savanna zone of Ghana is the only known home of the round-shaped yellow yam variety, "*Nkanee*". All the farmers interviewed cultivate this type of yam.

Yam cultivation in derived coastal savanna

Yam cultivation in this agroecology is markedly different from the yam cultivation in the other agroecologies in Ghana, due to the "under-digging" process of cultivation practiced only in this agroecology. Due to the thin layer of topsoil (10 cm deep) in the area, yam setts are planted in holes (Fig. 2) and covered with small mounds instead of big mounds. After clearing the land, the debris is burnt and holes with surface area of about 30 cm x 35cm and a depth 20cm are dug. The holes may be filled with organic matter several weeks before planting or planted without soil amendment, if the soil has natural fertility. Small mounds are then created on the holes (Fig.3). To avoid tuber

Fig. 2. Farmer making planting holes for cultivation of yams.

deformation or misshapen especially at the distal portion of the tuber, which often characterizes tubers harvested from such planting method (Orkwor and Asadu, 1997), farmers go back to dig under yam six months after planting (or good canopy formation) to allow for further penetration of the tuber (Fig.4). The "under-digging" is normally done when the plants have full canopy or 3-4

months after planting. This process is different from milking or double harvesting of yams often done in cultivation of white yams. Farmers in this agroecology still "milk" their yams after the "under-digging" process.

This under-digging is practiced only for *D. rotundata* due to the deep penetration of its tubers, and very poor yields could be obtained. For *D. alata* and *D. cayenensis* which are shallow-rooted no "under-digging" is needed. Studies

Fig. 3. Farmer "under-digging" planted yam at full canopy stage.

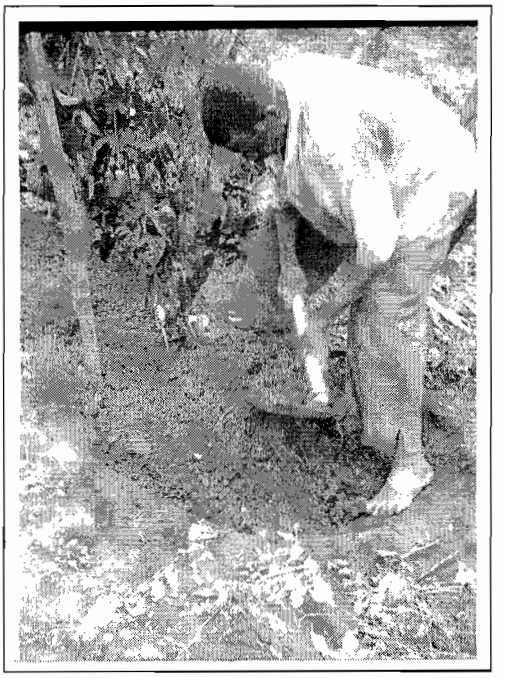

Fig. 4. Farmer completing "under-digging" process of yam planting.

Table 3. Characteristics▪ of some notable yam genotypes from "Bodwease".

	Variety			
Characteristics	*Maale*	*Brass*	*Kasante*	*Ntonto*
Root	Spiny	Spiny	Spiny	Spiny
Flesh colour	Yellow	White	White	White
Taste	Very sweet	Sweet	Sweet	Sweet
Texture	Mealy	Mealy	Mealy	Mealy
Poundability	Poundable	Poundable	Poundable	Poundable
Maturity Period (months)	8-9	8-9	8-9	8-9
Special Attribute	Like pona	Bluish colour at head region		Like Bamboo

▪As described by farmers and confirmed by the results of FPB exercise.

conducted in 2 years (2000-2001) using the 3 varieties and under-digging as factors, in RCBD with 3 replications confirmed this assertion (Table 4). No significant differences ($P<0.01$) were observed between under-dug and non-underdug, *D. alata* and *D. cayenensis*. However, a highly significant ($P<0.01$) yield reduction of about 75% was observed in the yield of non-underdug *D. rotundata* genotypes compared to the under-dug *D. rotundata*.

Table 4. Results of yield performance of 3 species of yams under 2 planting regimes in 2 years in the derived coastal savanna.

Species	*Planting Method*		*Mean*
	Under-dug	*Non-under-dug*	
D. alata	18.2	16.2	17.2
D. cayenensis	11.7	12.8	12.2
D. rotundata	17.6	4.4	11.0
Mean	15.8	11.1	13.5
SE for Variety	-	-	1.1
SE for PM	0.9		-
SE for V*PM	1.1		-

Past (Time immemorial to 1990)

Mention "Bodwease" to any elderly Ghanaian of age 50 years and above, and the first comment will be "Bodwease" yams" (Otoo, unpublished). They talk about "Bodwease" yams of old with nostalgia and wonder where all the sweet-scented white and yellow yams have gone. "Bodwease" was synonymous with yams.

Oral history

As recounted by 35 elderly farmers of Agona Mankrong and "Bodwease" in 2000 and 2002 including the chief yam farmer.

History has it that the whole of "Bodwease" area used to be thick forest with wild yams growing in it. The indigenes domesticated the yams. Due to the high yields being obtained at "Bodwease", the *Fantis* introduced water yam. The Bragu people from the Northern part of Togo after World War II introduced yam to "Bodwease" and its surrounding villages in about 1945. It was first grown at "Bontrase" and its surrounding communities such as *"Mfadwen", "Odotren", "Akubrifa", "Bantama", "Ama Eduah", "Onyame", "Kojo Esuom", "Akuabon", "Kwame Kwei", "Ayiresu", "Mampong", "Mfafo", "Berwamum", "Ahiritia", "Abuansa", "Chodioo"*, and *"Osimpoh"* No.1 & 2. Yams were cultivated in large acreages and sold in markets of all major neighboring towns and cities including Accra, Swedru and Mankessim. The natives considered yam cultivation as tedious work, hence yam farmers during this period were either the rich landlords who contracted migrant workers from the neighbouring countries and the northern part of Ghana to work for them, or few settler farmers. However, most of these migrant farmers left the country in 1972, as an Act of Parliament requested all aliens to leave the country after the 'Aliens Compliance Order', leaving

behind most of the germplasm to rot.

Most of the native young men who tried to salvage the situation failed because they either lacked the technical know-how to cultivate the crop or the planting materials were in a bad state at the time. As recounted by farmers in the informal survey, yam production therefore, almost came to a halt in 1972. Few farmers maintained some of the germplasm on subsistence basis and also as a past time.

The pineapple industry took over most of the yam lands around the aforementioned villages forcing the few yam farmers to move further inwards towards the north in the forest zone. Following a decline in the cocoa industry in 1983, more farmlands became available once again to yam farmers and new areas such as *"Obrachire", "Mankrong", "Kwaokurabi", "Osedu", "Ankama", "Fantse", "Bodwease", "Nyarkokwa", "Sarkwakuraa",* and *"Brofoyedur"* started growing yams. Other places were *"Okwabena", "Fianko", "Ofadaa", "Okwampa", "Ayensuako", "Penim", "Obodakawa", "Ofaso"* and others also started growing yams.

Present (1991 to date)

In 1998, Mr. Kweku Arhin of *"Osedu-Donkor"* grew yams in commercial quantities around Mankrong and this attracted the young men to also cultivate the crop. Today, in "Bodwease" and its environs, yam production is increasing but at a slow pace. In year 2000, more than 87,000 households produced and consumed yams in DCSZ representing 9.2% of the total households in Ghana growing yams (Table 5).

Research and development efforts are limited in the "Bodwease" area. Currently Crops Research Institute in

Table 5. Annual household production and consumption of yams in the coastal zones▪ of Ghana.

Parameter	*Coastal▪▪*	*Forest▪▪▪*	*Savanna*	*Ghana*
Estimated number of household harvesting yams	87,000	575,000	283,000	945,000
Annual value of harvest (billion cedis)	30.8	96.3	96.0	61.5
Annual value of sales (billion cedis)	1.3	8.5	41.3	31.3

▪*Source:* (GLSS4, 2000). ▪▪The derived coastal savanna is the only yam growing area in the coastal savanna. ▪▪▪Includes the forest-savanna transition.

collaboration with Ministry of Food and Agriculture (MoFA) is engaged in farmer participatory yam breeding effort in this area. The Ministry of Environment and Science in collaboration with MoFA has launched a programme to develop and promote the cultivation of three lesser known yam species *"Nkanee, Brass* and *Ntonto"*.

Yam production constraints

Elicited from 35 farmers and 3 extension agents at Farmer Participatory Breeding meetings at "Bodwease", Mankrong and Fantse "Bodwease" in 2000 and 2002. Farmers cited the following constraints as the most important factors in decreasing other of importance militating against yam production in the derived coastal savanna.

1. Availability and cost of planting materials. Ninety per cent of respondents identified this as the most important constraint to yam cultivation in the agroecology. This is very important for farmers who enter into yam production for the first time. Ordinarily, farmers save almost 25% of their previous harvest as seed for next season planting (Otoo *et al.*, 2001). Thirty per cent of the farmers indicated their unwillingness to purchase yam setts from the market since they often do not do well, coupled with high cost of planting material, making yam cultivation in general very expensive. They also contended that planting materials often brought in from the Guinea Savanna, have poor quality in terms of sprouting.

2. Staking was ranked the most important and costly constraint by all the respondents after availability and cost of planting materials. This is because as indicated by Tetteh and Saakwa (1994), each stand need to be singly staked and dominant materials used for staking is bamboo, which must be cut and conveyed over long distances to yam farms. Ninety per cent of the farmers indicated that it often set the limit as to the scale of production for most farmers especially when one cultivates *D. rotundata*. They indicated that since *D. cayenensis* and *D. alata* are hardy, they can afford not to stake and yet get good yields.

3. Land preparation was the third most important constraint to yam production in the study area. This includes, land clearing, mounding and under-digging of yams. Seventy per cent of the farmers indicated that presently land is becoming scarce raising the cost of land acquisition. Farmers scarcely find land to grow yams around 'Bodwease' and 'Bontrase' areas because of influx of pineapple farmers. The keen competition among yam farmers and tree crop farmers around Mankrong area makes yam production a challenge.

4. High labour cost: Generally hired labour cost is becoming increasingly very expensive as a result

yam production is also becoming expensive (Tetteh and Saakwa, 1994). The closeness of the town to Accra also comes with it a comparatively high cost of living. Land preparation can cost up to ¢10.3 million ha^{-1}; and staking ¢13.3 million ha^{-1} (Table 6). The cost of production in the DCS is almost three times that of the Forest and Forest-Savanna Transition. Similar trend was observed in net benefit.

5. Marketing problems: Inconsistencies in pricing of yams at harvest period, and lean period, coupled with unstructured marketing outlets makes it very difficult to obtain fair prices for the produce.

6. Harvesting and conveyance is difficult. The nature of the soil forces farmers to under-dig their yams when the full canopy develops. This practice allows the yam tuber to penetrate deeper into the soil. Harvest becomes difficult and labour intensive. Yam tubers thus obtained are often bulky and a farm that is 3km from the nearest road needs over 350 persons (each carrying a head load weighing 25-30 kg of yam) to convey a tuber yield of 10t ha^{-1} (Tetteh and Saakwa, 1994). This also adds to the total cost of production.

Future

The derived coastal savanna zone is home to more than 30 large-scale commercial pineapple, papaya and citrus producers who have tried their hands on 1-5 acre holdings of yams in the past 5 years (Personal communication with farmers, agricultural extension agents). Marketing was the main constraint of these farmers, because the prices offered by the market women who come to the farmgate were unacceptably low. If these farmers are linked to the exporters of yams, this constraint could be solved. Export market can offer constant and agreeable price for the yams.

Contrary to Tetteh and Saakwa's (1994) assertion that mounding is not a problem in this area since mounds of 60 cm or less high is created, experience shows that the small size of mounds is compensated for by the need to under-dig the yams after 3-4 months of planting or full canopy formation, both in terms of cost and physical energy. Mechanization of farming operations will minimize the drudgery associated with yam cultivation and encourage more young men and women into yam production. Land preparation by ploughing and harrowing and also planting on ridges will eliminate the need for under-digging under the yams. This will greatly enhance yam cultivation and reduce the cost of production.

Promotion and funding of research and development of yams in the area and Ghana as a whole will greatly increase the productivity of the crop. Ghana's yam has a growing demand in Europe

Table 6. Partial budget analysis♦ of yam production in 3 agroecologies.

	On hectare basis		
	Forest	*FST*■	*DCS*■■
Average yield (t ha^{-1}) ■■■	19.8	26.8	32.2
Adjusted yield (t ha^{-1})	17.82	24.12	28.98
Price per 110 tubers of 5kg size at harvest	400,000.00	400,000.00	600,000.00
Price per 110 tubers of 5kg size at lean period	700,000.00	700,000.00	1,200,000.00
Gross field benefits (cedis ha^{-1})			
At harvest	18,423,529.41	18,917,647.06	34,094,117.65
Lean period	18,344,117.65	24,829,411.76	51,141,176.47
Adjusted yield for 25% storage loss in 2-3months (t ha^{-1}) lean period	13.37	18.09	21.74
Costs that vary (cedis ha^{-1})			
Renting of land■	250,000.00	75,000.00	625,000.00
Land preparation			
Clearing	375,000.00	450,000.00	625,000.00
Ploughing	375,000.00	450,000.00	625,000.00
Mounding	1,818,181.82	2,727,272.73	4,545,454.55
Under-digging	0.00	0.00	4,545,454.55
Sub total	*2,568,181.82*	*3,627,272.73*	*10,340,909.09*
Planting including cutting and treatment of yam setts(15 man-days)	225,000.00	300,000.00	375,000.00
Staking			
Material cost including cost of transporting	10,000,000.00	8,000,000.00	12,000,000.00
Labour (contract)	625,000.00	625,000.00	1,250,000.00
Field maintenance 4x	1,125,000.00	1,800,000.00	2,500,000.00
Harvesting (15 man-days)	300,000.00	300,000.00	375,000.00
Total Costs that vary	**14,843,181.82**	**14,652,272.73**	**26,840,909.09**
Total Costs that vary US$ @1US$=8500♦	1,746.26	1,723.80	3,157.75
Net benefit (in cedis)			
At harvest	3,580,347.59	4,265,374.33	7,253,208.56
Lean period	3,500,935.83	10,177,139.04	24,300,267.38
Net benefit (US$)	**421.22**	**501.81**	**853.32**
	411.87	**1,197.31**	**2,858.85**

■ Forest-Savanna Transition, ■■ Derived Coastal Savanna. ■■■ Based on 2003 on-farm farmer-managed trials production figures. ♦ 2003 exchange rate.
Cost of renting land is 150,000, 180,000 and 250,000 cedis/ acre for Forest, Forest-Savanna Transition and Derived Coastal Savanna respectively.
♦ *Source:* Data obtained from farmgate prices and farmer participatory breeding yield data in the 3 agroecologies.

and USA that have a large population of immigrants from the humid and sub-tropics (Asuming-Brempong, 1991). The export of yams must therefore be encouraged. The strategic location of "Bodwease", the closest of all yam-producing areas to the ports, can provide a ready-market for yam exporters and facilitate rapid transportation of yams to ports. This will greatly reduce cost of transportation and reduce risk of post-harvest losses associated with carting of yams over long distances. In an attempt to reduce the number of unemployed youth, Government can acquire land in this area and provide the seed capital for the youth to enter into yam production for export.

Conclusion

The derived coastal savanna zone of Ghana used to be synonymous to yam production. Yam cultivation in the DCSZ is also unique in that yams are planted in holes and must be under-dug especially for *D. rotundata* if yield reduction is to be avoided. Yam production in the DCSZ has declined in recent past. Currently, the soil, climatic and the socioeconomic factors still favour yam production. The study area could provide a major food basket with respect to yams and facilitate export of yam.

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