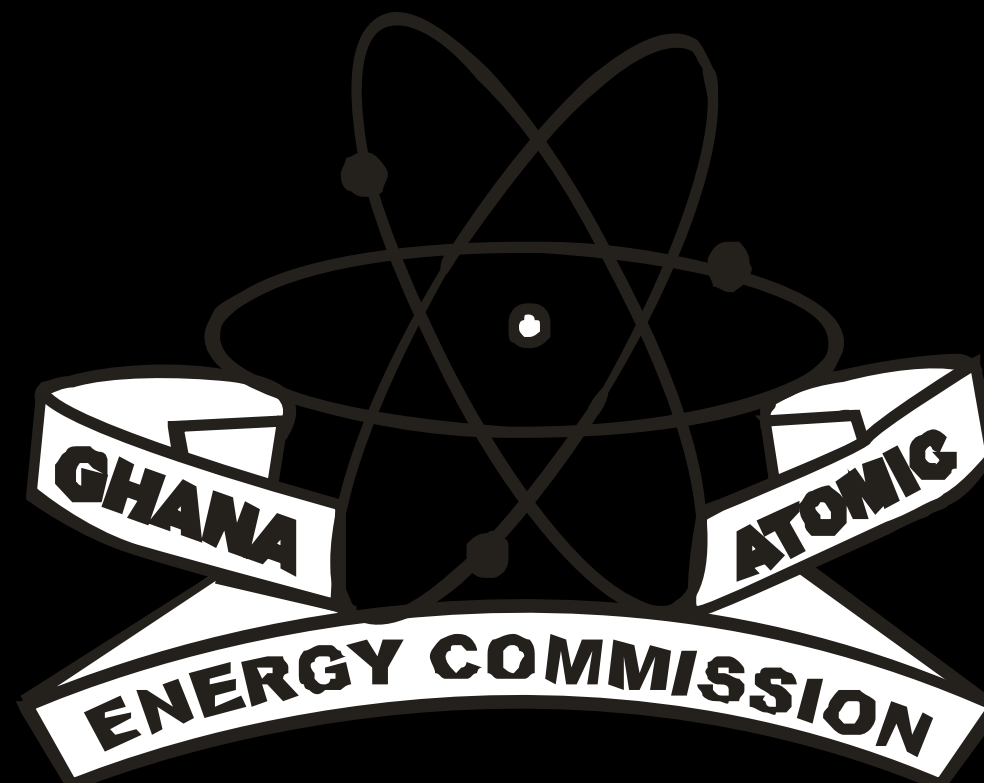




# Improving Market Demand and Productivity Level For an Underutilised Yam (*Dioscorea esculenta*) in Ghana: Implications for Crop Breeding and Production Choices



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## Background

The underutilised yam *Dioscorea esculenta* or Chinese yam locally called “oboaduonum” or “broni bayere” is a high valued commodity in Ghana but it is a threatened species due to their displacement by improved varieties, deforestation and lack of scientific research to improve upon the crop. The full potential of *D. esculenta* for income generation both through domestic markets and export trade has not been realised due to neglect in production, handling and marketing systems as a result of its small size that inhibit its use for food and agriculture in Ghana.

## Aim

The purpose of this study was to improve the size of the tubers using gamma radiation and to promote market value of *D. esculenta* to enhance its utilisation at both the local and international markets.

## Methods

The survey on market demand and productivity level assessment focus on “ex-ante” or “ex-post” evaluations of the underutilized yam *Dioscorea esculenta*. Both primary and secondary methods were used for data collection from forty yam producers mainly from the Northern and Eastern Region of Ghana were interviewed. 115 people were interviewed in a market survey in the Greater Accra Region, the centre of yam marketing. The field survey (ex-ante and ex-post) took place from October 2009 to January 2011 using standardized questionnaires. To improve the size of the tubers of *Dioscorea esculenta*, repeated experiments with different doses of radiation at 10, 20, 30, and 40 Gy.

## Results

47% of the farmers interviewed were 30 years and above. The minimum household number was 1 and the maximum was 9 with 23% of interviewed farmers having an average household size of 4. 46% of interviewee had high school education while 20% of farmers had basic school education (Table 1). Most of the farmers (64%) interviewed had been farming for more than 15 years. 53% of the farmers (below 30 years) who had been farming for less than 15 years were aware of “oboaduonum” but had never seen it. All farmers cultivated at least more than three species of yam and the important amongst them are ‘Laribako’, ‘Muchumudu’, ‘Kulunku’ ‘Fuseini’ and ‘Nyumbo’ with ‘Puna’ being the most popular landrace cultivar for both local and the international market. The average farm size is 3.7 acres, minimum is 1 and maximum is 5.

## Results

92% of the farmers interviewed were aware of *D. esculenta* but 43% of them are cultivating it on less than 2% of the total land area. Tuber weight exhibits a diminishing marginal value and price per kilogram decreases below an optimum size; therefore, producers do not derive additional reward from cultivating “oboaduonum” small tubers.

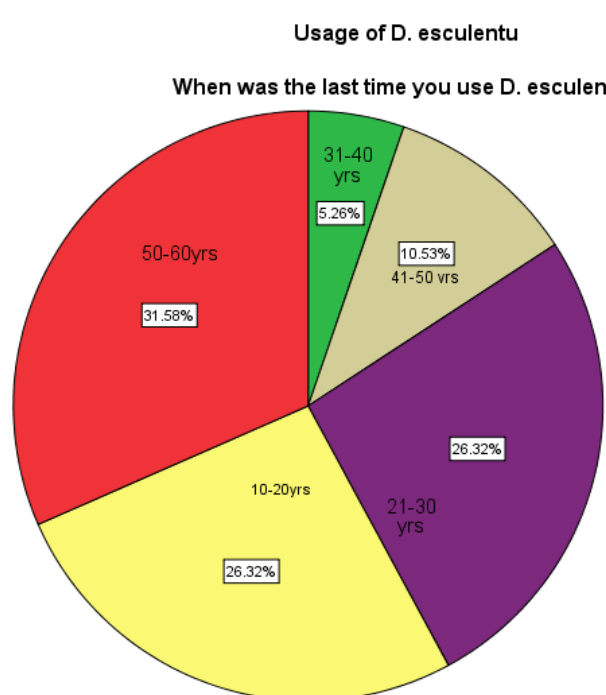


figure 1. Aging and awareness of “oboaduonum”

Table 2 indicate that as household size increases, farmers turn to cultivate or adopt cultivation of “oboaduonum” variety and other varieties to feed family. It also shows that as farmers aged, they shun away from the cultivation or adoption of *D. esculenta*, although it is the aged group that knows the crop. Our survey indicated that young yam farmers below the age of 30 do not know the crop while those above have cultivated the variety before. The result indicated that awareness of “oboaduonum” existence among farmers is directly correlated with experience of farmers and farming years (figure 1). This observation poses serious genetic erosion threat to the crop.

| Variable | Obs | Mean     | Std. Dev. | Min | Max |
|----------|-----|----------|-----------|-----|-----|
| age      | 40  | 2.75     | .438529   | 2   | 3   |
| hhsz     | 39  | 4.092308 | 2.214234  | 1   | 9   |
| edu      | 40  | 2.725    | 1.079247  | 1   | 4   |
| fmyrs    | 40  | 3        | 1.281025  | 1   | 15  |
| oboedu   | 40  | .45      | .5038315  | 0   | 1   |
| aware    | 40  | .975     | .2761921  | 0   | 1   |
| farmsize | 40  | 3.7      | 1.697661  | 1   | 5   |
| seedavai | 40  | .5       | .5063697  | 0   | 1   |

Table 1. Demographics and farming statistics

Table 2. Stata outputs analysis of variance (ANOVA) results along with the regression results. Top left is ANOVA table, and bottom is regression results.

| Source   | SS         | df | MS         | F     | Pr > F | [95% Conf. Interval] |
|----------|------------|----|------------|-------|--------|----------------------|
| Model    | 7.86605192 | 3  | 2.62201731 | 53.24 | <.0000 |                      |
| Residual | 1.72369167 | 35 | .49248334  |       |        |                      |
| Total    | 9.58974359 | 38 | .252361673 |       |        |                      |

|          | Coef.     | Std. Err. | t     | Pr >  t | [95% Conf. Interval] |
|----------|-----------|-----------|-------|---------|----------------------|
| age      | -.0661358 | .0919154  | -.072 | 0.477   | -.252734 .1204623    |
| hhsz     | .0197063  | .0179957  | 1.10  | 0.281   | -.0168269 .0562395   |
| edu      | .8902708  | .0765794  | 11.63 | 0.000   | .7348064 1.045735    |
| seedavai | .0911574  | .2303037  | 0.40  | 0.695   | -.3763841 .5586988   |

Oboedu = .092 - 0.066age + 0.019hhsz + 0.891seedavai

An R Square of 0.82 means that differences in age, household size and seed availability can explain 82% of the variation in adoption rates of “oboaduonum” (Table 2).

Thus, to effectively enhance adoption of “oboaduonum” variety, research should focus on improving the tuber size as well as its nutritional content. The numerous tubers produced by the plant already make it an ideal candidate for adoption as shown in the figure 1.

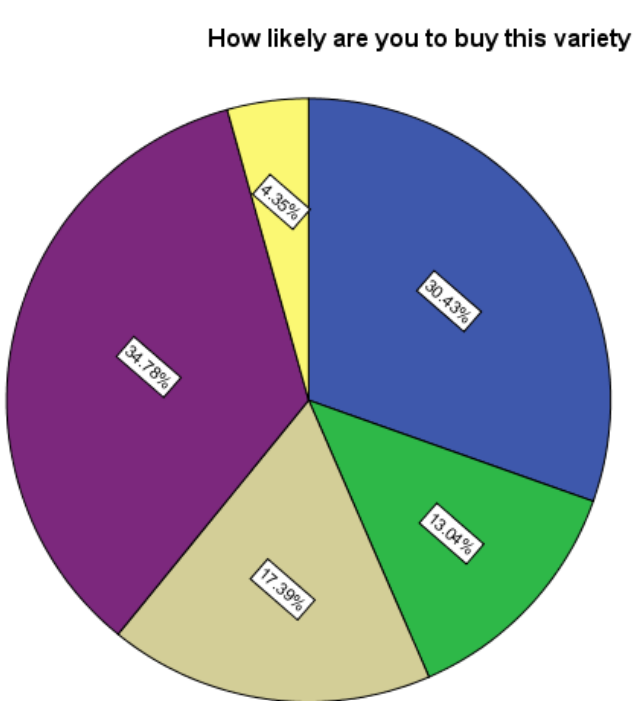


Figure 2. showing chances of adoption of oboaduonum bariety by market women

## More results

Observation through repeated experiments indicated that irradiation of tubers at 40 Gy decreased the number of tubers per vine and marginally increased the tuber size at M1 generation suggesting a correlation between tuber size and number of tubers per vine.

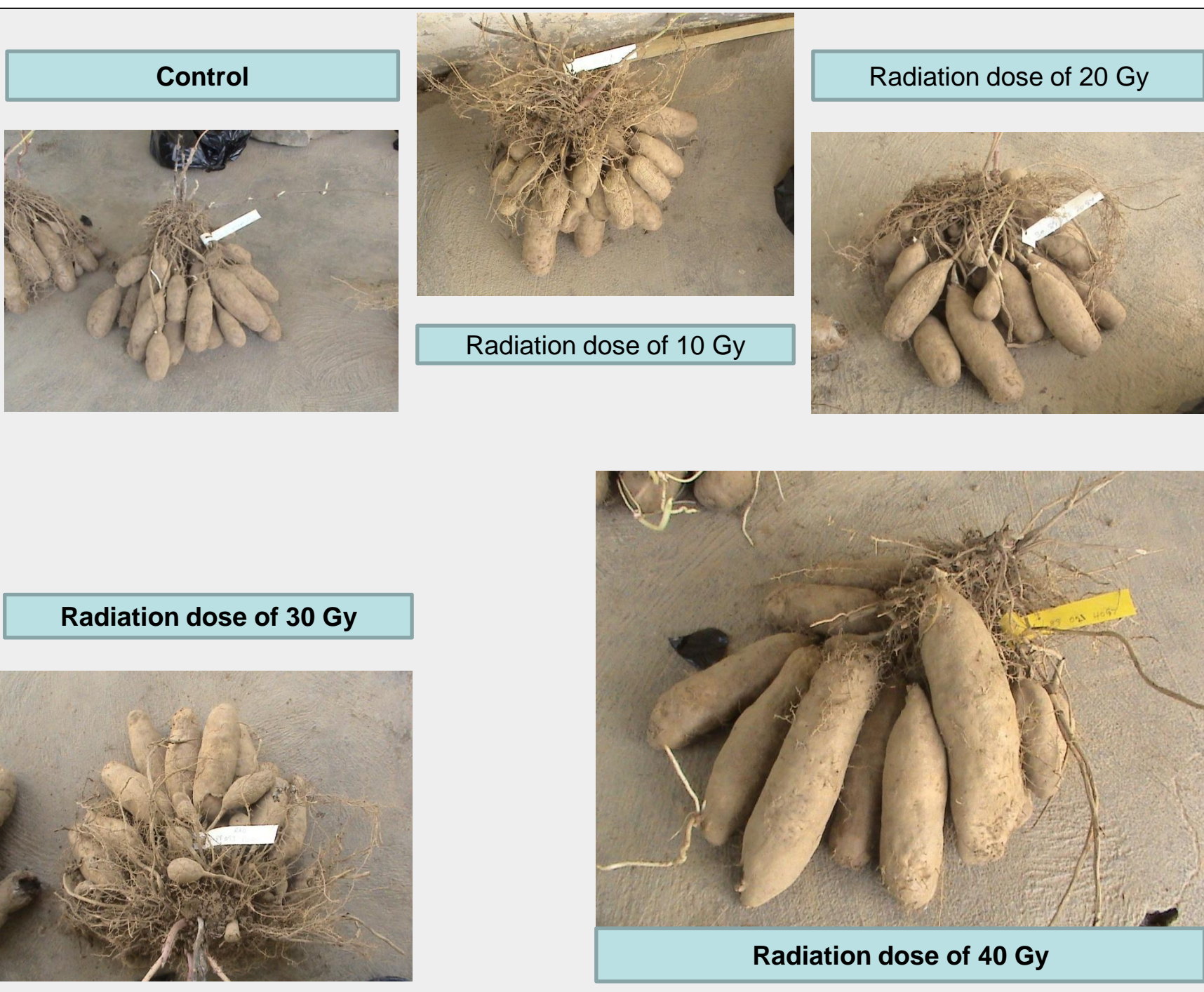


Figure 3. Results of repeated experiments with different doses of radiation at 10, 20, 30, and 40 Gy, yielding different tuber sizes of the underutilized yam “Dioscorea esculenta”.



Figure 4. All those with yellow tags are “Dioscorea esculenta” of radiation dose of 40Gy against 30, 20, 10 Gy and the control respectively

## Conclusions

The results of market survey indicated that “oboaduonum” is nearing extinction and farmers are willing to cultivate it if the size is improved and planting materials made available. The size and weight of the tubers increased to an average of 1 kg against 0.3 kg/tubers of the control (unirradiated planting material). Tuber weight exhibited an increasing marginal value and price per kilogram increased above an optimum size; therefore, producers derive additional reward from extra-large tubers. We conclude that, to effectively access and benefit from urban markets, producers should focus on the improved size and conical shaped-tubers, which are easy to process and meet the aesthetic qualities preferred by urban consumers.

## References

1. Li Longwe, 1995: Malawi country report to the FAO on plant genetic resource.
2. Geoffrey Hawtin, 2007: Underutilized Plant Species R&D Activities.

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