DETERMINANTS OF ADOPTION/UTILIZATION LEVEL AMONG BENEFICIARIES OF COCOYAM VALUE ADDITION TRAINING IN OHAFIA AGRICULTURAL ZONE BY NATIONAL ROOT CROP RESEARCH INSTITUTE, UMUDIKE IN ABIA STATE, NIGERIA

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Abstract

The study examined the Factors Enhancing Adoption/Utilization Level of Beneficiaries of Cocoyam Value Addition Training in Ohafia Agricultural Zone, by National Root Crop Research Institute, Umudike in Abia State, Primary data were collected with the use of a well structured questionnaire which was administered on 120 respondents that were purposively selected from the list of cocoyam value addition trainees collected from Agricultural Development Programme (ADP). The result showed that 35% of the respondents were within the age bracket of 46-55 years, 35% of them attended secondary education, 57% of them were full time farmers, 43% of them had income ranging from N50,000-69,999, 59% of them had farming experience ranging from 21-30 years and 87% of them were married. The result of the regression result showed that double-log function was chosen as the lead equation having satisfied most of the apriori expectations. Educational level, household size, age, income, frequency of visit and cooperative membership were the factors enhancing the level of adoption/utilization of the cocoyam new processing technologies by the beneficiaries in the study area. Based on the findings, it was concluded that the training was effective/positive. Therefore the research recommended that farmers should be encouraged to get basic education as this will enhance the productivity of the farmers, thereby increasing their income level.

Introduction

Cocoyam is an indispensable root crop which constitutes the major staple food items of some 60 per cent of Nigerians (Okoye, 2009). It plays a crucial role in the sociological, nutritional and economic development of the country (Eke-Okoro *et al.*, 2004). Cocoa yam has been in existence in Nigeria for many decades, farmers have not been enjoying good pricing of the crop. This was because people regard cocoyam as poor man's food, and there was little or no processing of this crop to make it valuable. Hence, farmer's earnings were not commensurate with the efforts they put in cocoyam production. In an effort to guard against poor earnings and encourage people to eat cocoyam, the present administration in Nigerian came up with "Cocoyam Rebirth Programme". The purpose of which is to promote the new and improved forms of processing and utilization of cocoyam for sustainable food production, income generation, increased source of medicine for diabetic patients and possible foreign exchange earnings in the country (Aniedu, 2004). Cocoyam (*colocasia* and *xanthosoma* spp) is consumed in different forms. Cocoyam can be consumed fresh as tuber after cooking; used as soup thickener, processed into "*Achicha*", pounded as fufu, roasted in fire, and can also be fried into chips(Oluwakemi,2001). Cocoyam has different varieties. For example, the *Colocasia Spp* is used mainly for "*Achicha"* and as soup thickener, while other *SPP's* are used, cooked pounded and roasted (NRCRI, 2004). Cocoyam varieties are rich in vitamins and

may be used also as cash crop, snacks; feed for livestock or as industrial crop for production of alcohol and medicines (Amamgbo, 2010). They are good source of carbohydrates for diabetic patients and convalescents, and fortified food for infants (Ibe, 2008). Even though the nutritional quality of cocoyam compares favorably with other root crops, the status of cocoyam in its use at home is quite low. The reason for this low status range from cultural bias to the prejudice is that cultivation of cocoyam is seen as a woman's job, (NRCRI, 2010). With this, cocoyam as part of the mandate crop of National Root Crops Research Institute (NRCRI), Umudike, Nigeria has become the largest producer of cocoyam in the world, and accounted for an annual production of about 587 thousand metric tonnes (FAO, 2010). The nutritional, sociological and economic relevance of cocoyam to both man and livestock cannot be overemphasized. National Root Crop Research Institute (NRCRI), Umudike recently developed several cocoyam value added technologies aimed at addressing the high perishability of cocoyam tuber (or corms and cormels) as well as diversifying the use of cocoyam. These technologies make it possible for an array of secondary products like Bread, Biscuits, Cake, Chin-Chin, Doughnut, Chips, Salad cream etc. to be derived from cocoyam flour (NRCRI News Bulletin, 2006). Furthermore, through various processing and utilization techniques alternative uses of cocoyam have resulted in the emergence of wide array of food recipes through value addition. Thus all practices involved in diversifying the processing and utilization of cocoyam roots are termed value adding technologies. According to Aniedu (2004) these emerged as a result of rising demand for making cocoyam products available in more widely and readily usable forms. This study was therefore to examine the effectiveness of cocoyam value addition training programme on the livelihood activities of the beneficiaries.

Methodology

The study was conducted in Ohafia Agricultural Zone, Abia State of Nigeria. Abia is a State in the South Eastern part of Nigeria. The capital is Umuahia and the major commercial city is Aba. The commercial hub, Aba was formerly a British colonial government outpost in the region. Abia state was created in 1991 from part of Imo State. It is one of the constituent states of the Niger Delta region (Asiedu, 2007). Abia State, which occupies about 5,834 square kilometers, is bounded on the north and northeast by the states of Anambra, Enugu, and Ebonyi. To the west of Abia is Imo State, to the east and southeast are Cross River State and Akwa Ibom State, and to the south is Rivers State. Farming in the State is determined by the seasonal distribution of rainfall. The main food crops grown are yam, cassava, rice, cocoyam and maize while the cash crops include oil-palm, banana various types of fruits, cocoa and rubber. There are three agricultural zones in Abia State; Ohafia, Aba and Umuahia agricultural zones. Ohafia agricultural zone was purposively selected because, it is a major cocoyam producing zone in the state. The study was carried out in two Communities (Ezeukwu and Igbere) in Ohafia Agricultural Zone. Ohafia agricultural zone is located in the Northern part of Abia State. It is made up of five blocks namely: Arochukwu, Bende, Isuikwuato, Uzuakoli and Umunneochi. These Communities (Ezeukwu and Igbere) in Ohafia zone were chosen for this study because they have vast and fertile land for cocoyam production. The two Communities were purposively selected because they are the major cocoyam producing areas in the Zone under study. From the ADP Extension Agent supervising each the blocks, the list of trained women cocoyam farmers was obtained. The two Communities in Ohafia Agricultural Zone, namely Ezeukwu and Igbere were purposively selected as a result of their involvement in cocoyam production. Sixty (60) cocoyam value addition trainees were randomly selected from each of the two Communities making a total of one hundred and twenty respondents for the study.

Analytical Techniques

The analytical tools used were descriptive statistics such as mean, frequency, tables and percentages and multiple regression models. The models are specified as follows;

In implicit form, the model is specified as

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8,)$…… (1)

Where;

Y = Adoption/Utilization level among beneficiaries of Cocoyam Value Addition Training

X_1 = Age (years)

X_2 = Years of formal education (years)

X_3 = Family size (Number of persons in a household)

X_4 = Income of beneficiaries

X_5 = Experience

X_6 = Marital status Income level (₦)

X_7 = Membership of Cooperative Society

X_8 = Frequency of contact by agents extensión (Regular = 1, Not Regular = 0)

U = error term

Results and Discussion

Socio-economic Characteristics

The result showed that 36% of the beneficiaries were within the age bracket of 46-55 years. This implies that majority of the respondents belong to the middle-aged group and are known for their physical ability, productiveness and mental alertness in learning new technologies than older farmers (Achike, 2009). Majority (36%) of the respondents attended secondary education. According to Okoye *et al.*, (2009), educated farmers are expected to be more receptive to improved techniques while farmers with little or no education are less receptive to improved technologies. About 57% of the beneficiaries were full time farmers. This is not surprising because full-time farmers tend to be less amenable to income diversification than their part-time counterparts. Majority (60%) of the respondents had farm sizes of 9-12 persons. This is in line with the perception of Obika, (2011) who posited that large family size necessitated respondents to learn new technologies for increasing their returns, to sustain their families. About 43% of the respondents had income ranging from N50, 000- N69, 999, 59% of them had farming experience ranging from 21-30 years. (Okoye, 2009) observed that experience is a major factor in the adoption of technologies and should serve as an advantage for increased investment and technology utilization. Majority (87%) of the respondents were married. This implied that majority of the beneficiaries were married. This must have been necessitated based on the need not only to boost food production but also to argument family incomes in addition to their traditional roles in the family as mothers and home makers.

Table 1: Distribution of the Respondents According to their Socio-economic Profile of the Respondents

Variables Age (years)	Frequency (n = 120)	Percentage
26-35	**23**	**19.00**
36-45	**23**	**19.00**
46-55	**42**	**35.00**
56-65	**32**	**27.00**
Education (years)		
No. Formal Education	**24**	**21.00**
Primary Education	**25**	**21.00**
Secondary Education	**42**	**35.00**
Tertiary Education	**27**	**23.00**
Occupation		
Full time farming	**69**	**57.00**
Part time farming	**50**	**43.00**
Family Size		
1 – 4	**15**	**12.00**
5 – 8	**33**	**28.00**
9 – 12	**72**	**60.00**
Income (Naira)		
10,000 – 29,999	**33**	**27.00**
30,000 – 49,999	**36**	**30.00**
50,000 – 69,999	**51**	**43.00**
Experience (years)		
1 – 10	**12**	**10.00**
11 – 20	**33**	**28.00**
21 – 30	**71**	**59.00**
31 – 40	**4**	**3.00**
Marital Status		
Married	**105**	**87.00**
Single	**15**	**13.00**

Determinants of Adoption/Utilization Level among Beneficiaries of Cocoyam Value Addition Training

To analyze the Determinants of Adoption/Utilization Level among the Beneficiaries of Cocoyam Value Addition Technology Training in Ohafia Agricultural Zone by National Root Crops Research Institute, Umudike, regression models were estimated. The four functional forms of the regression models were tried and the lead equation was selected based on statistical and econometric criteria such as number and signs of significant variables, their conformity with a prior expectation, magnitude of R^2 and F-ratio. The result is presented in Table 1. The double-log

function was chosen as the lead equation because of the number and levels of significant variables. The result showed that educational level, family size, income, age, frequency of contact and membership of cooperative significantly influenced the adoption/utilization level among the beneficiaries of cocoyam value addition training of the National Root Crops Research Institute.. Family size, membership of cooperative and frequency of contact was significant at 1% level of probability and were all positively related to the adoption level of the beneficiaries of the cocoyam value addition training in the study area. Age was significant at 10% level and was negatively related to the adoption level among the beneficiaries. Educational level of the respondents was significant at 5% level and was positively related to the utilization level of the Cocoyam Value Addition Technology packages by the beneficiaries. Age of the respondents was negatively related to the income level of the respondents, this implies that the older the beneficiaries in age, the lower the adoption level of the beneficiaries. This is in consonance with the findings of (Obika, 2011) who found that older farmers are less willing to try new innovations or take risk. Educational level of the respondents was positively related to the adoption/utilization level of the Cocoyam New Technology Packages by the beneficiaries in the study area. This implies that the higher the educational level of the beneficiaries, the higher their adoption/utilization level. The result further implied that farmers that participated in the training programme had good educational qualification.

Table 2: Regression Results of the Determinants of Adoption/Utilization Level among Beneficiaries of Cocoyam Value Addition Training in the Study Area

Variables	Linear	Double Log	Exponential	Semi Log
Constant	33.253++	7.121++	4.467+++	61.646
	(2.655)	(3.279)	(6.615)	(-.766)
Age	-0.445	-1.012	-.016	-29.499
	(-0.928)	(-1.914)+	(-1.444)	(-1.334)
Education	1.968	.801	.074	20.227
	(2.399)++	(2.989)++	(3.365)+++	(1.998)+
Family Size	2.818	1.200	.034	7.964
	(1.617)	(5.813)+++	(.737)	(2.831)++
Income	5.562	-.077	-5.356	1.975
	(7.588)+++	(-.468)	(3.310)+++	(.305)
Experience	-.361	.034	-.005	1.504
	(-.578)	(.213)	(-.352)	(.205)
Marital Status	2.271	.036	.106	-.612
	(.205)	(.137)	(.404)	(-.056)
Membership of	-14.684	.958	.910+++	-12.745
Cooperative Society	(-1.853)	(4.715)+++	(-4.396)	(5.990)+++
Frequency of Contact	-.976	.880	.008	1.143
	(-.516)	(5.606)+++	(-.185)	(-.170)

Source Computed from Field Survey (2010)
+ = Lead equation
+++, ++ and + denote significance at 1%, 0.5% and 10% levels of probability.

Family size was positively related to the adoption/utilization level among the beneficiaries. The result implies that beneficiaries with reasonable family size could hire less labour and make use of family labour which will not attract much cost in the production of cocoyam value addition products; this will in turn enhance the adoption/utilization level of the beneficiaries. Frequency of visits by the extension agents and membership of cooperative were positively related to the adoption/utilization level of the beneficiaries. This implies that being a member of a cooperative and frequency of visit by the extension agents will increase the adoption/utilization level of the beneficiaries in the study area of Ohafia Agricultural Zone.

Conclusion

Based on the findings of this study, it was concluded that family size, educational level, age,, income, frequency of contact and cooperative membership had positive effect on the adoption/utilization level of the beneficiaries of cocoyam value addition training programme by the National Root Crops Research Institute, Umudike. Education enhanced participation, and adoption/utilization level of the Cocoyam New Technological Packages by the beneficiaries. Farmers should be encouraged to acquire basic education so as to enhance their productivity. Extension agents should increase their visits to farmers to enhance their access to information on cocoyam value addition technologies.

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ADOPTION OF VALUE ADDITION TECHNOLOGIES OF ROOT AND TUBER CROPS FOR INCREASED RURAL LIVELIHOODS IN ABIA STATE, NIGERIA

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Abstract
Value addition technologies of Root and Tuber crops were developed to ensure the reduction of post-harvest losses and empowerment of resource poor farmers (especially women). In spite of this, post-harvest losses and poverty are on the increase especially in rural areas. This study therefore seeks to determine the level of adoption as well as the factors that affect the adoption of value addition technologies of some root and tuber crops in Abia state, Nigeria. A multi-stage random sampling procedure was used to select 120 rural farmers from two agricultural zones in the State. Data were collected with the use of structured questionnaires and analyzed with descriptive statistics as well as multiple regression analysis. Results indicated low level of adoption of value addition technologies of root and tuber crops in the state. Regression result revealed an R^2 value of 0.3770 indicating that 37.7% of variation in the adoption of value addition technologies of root and tuber crops was accounted for by the variables considered in this research. Additionally, the result showed that Extension contact (1%), Educational level (5%) and Farm size (5%) were positively related to respondents' adoption of these technologies. Therefore, the study recommends among other things increased promotion and popularization of these technologies by the state ADP.

Keywords: Adoption, Value addition technologies, Root and Tuber Crops and Rural Livelihoods

Introduction

Root and tuber crops are the second most cultivated group of crops, after the cereals in developing countries and are usually cultivated by subsistence farmers who use traditional and labour intensive methods of production. These crops provide income generating opportunities through direct sale and value-addition (processing) and are of vital importance for food security (IITA, 2009). Furthermore, they improve and diversify the rural economy of developing nations, reduce poverty and are major sources of livelihood for women and other resource - poor farmers. These crops have not realized their full potentials in most developing countries because they are highly perishable which results in substantial post-harvest losses (FAO, 2016). One of the ways through which post-harvest losses can be reduced and rural farm income increased is "adding value" to raw agricultural products. Value addition to agricultural products is a way of enhancing the economic value and making agricultural commodities attractive to consumers (Sauzet, 2009). It means to economically add value to a product by changing it to a state that is more preferred by consumers. Farmers produce raw materials for the food market and this raw materials/produce can be converted into value added products by processing. The major reason for processing is to extend the shelf life of the product beyond the period when there is excess into the period when there is scarcity and also to facilitate transportation (especially of root and tuber crops because of their bulky nature). Value addition plays a significant role in improving livelihood of small scale rural farmers. Value added products offer a higher return, open new markets, create recognition for a farm, expand the market season, and make a positive contribution to the rural community.

Adoption of innovation is the last stage in a decision process to continuously use an innovation knowing that such will impact positively on the livelihood of the adopter (Chambers, 1993). Consequent upon this, National Root Crops Research Institute, Umudike (NRCRI) and Federal Institute of Industrial Research, Oshodi (FIIRO) not just developed but also promoted value-addition technologies of root and tuber crops in order to ensure the reduction of post-harvest losses and increased livelihood as well as income for resource poor farmers (especially women). Despite these efforts, post harvest loss is still high. This necessitated the need to study the adoption of these technologies by the farmers. It is thus pertinent to ask the following questions, what is the level of adoption of these technologies? What are the factors that affect the adoption of these technologies? The broad objective of the study was to examine the adoption of these technologies among rural farmers in Abia State Nigeria. The specific objectives of the study include to: 1) ascertain the socio-economic characteristics of the respondents 2) determine the level of adoption of value-addition of root and tuber crops in the study area 3) determine the factors affecting adoption of value-addition of root and tuber crops in the study area.

Methodology

The study was conducted in Abia State, Nigeria. Abia State lies between longitude 7^0 231 and 8^0 21 E and latitude 4^0 471 and 6^0 and 121 N. Multistage random sampling procedure was used to select 120 respondents. Firstly, two out of the three agricultural zones in the state were randomly selected namely Aba and Umuahia zones. Secondly, two LGAs were randomly chosen from each of the selected agricultural zones giving a total of four LGAs. The third stage involved the random selection of two communities from each of the selected LGAs and finally, fifteen respondents were also randomly selected from each of the communities selected giving a total of 120 respondents. Structured questionnaires were used in the collection of data from the respondents. Data collected were analyzed with descriptive statistics, Likert-type scale as well as multiple regressions. Although the four functional forms of multiple regression analysis were used in the analysis, the Exponential function was chosen in interpreting the result because it showed higher sensitivity in the measure of the variables than the other functions. For the adoption level, values were assigned to the various stages of adoption using a five point hedonic scaling pattern as follows; unaware = 0; aware = 1; interest = 2 evaluative = 3; Trial = 4, Adoption = 5. Thus, scores for adoption level of each of the component technologies was obtained by multiplying out accrued number of respondent by the point attached to each adoption stage and then divided by the total number of respondents. Furthermore, farmers' adoption of the technologies was categorized into three: high, medium and low. The categories were obtained by dividing the five spaces in the 0-5 point scales into three parts as employed by Onu and Obibuaku (1987). This gave a unit interval of 1.67. This unit interval was then subtracted successively from maximum point downwards to obtain the lower class marks. Therefore, categories of adoption were classified as follows 5-3.33 = High; 3.32 – 1.65 = Medium; 1.64 and below = Low adoption.

Results and Discussion

Table 1 which is assessment of the level of adoption of selected value-addition technologies in the study area indicates low level of adoption (1.14) for the selected value-addition technologies of root and tuber crops. Of the seven value-addition technologies of root and tuber crops selected, there was low level of adoption of six out of the seven. For instance, processing of cassava into chips (1.53), processing of ethanol/starch (1.04), use of HQCF for confectionaries like bread, cake etc (1.41), processing yam into yam flour (0.78), processing cocoyam into soup thickener (0.68) and processing of cocoyam into chips (0.63). On the other hand, processing of cassava into HQCF (1.87) had medium adoption. The result on table 1 also shows that majority of the respondents were

not aware of technologies like processing of yam into yam flour, processing of cocoyam into soup thickener, and processing of cocoyam into chips. Result of Table 2 which is a regression analysis indicates an R^2 value of 0.377 for the independent variables ($X^1 – X^8$). This implies that 38% of the variation in adoption of value-addition technologies of root and tuber crops in the study area was explained by the aforementioned independent variables. The result also reveals that four variables viz: Education (5%), Farm size (5%) and Extension contact (1%) were positively related to adoption while Income (5%) was negatively related to adoption. Level of education of respondents indicated a significant positive relationship with adoption of value addition technologies of root and tuber crops. This implies that individuals that are educated are more likely to adopt technologies than those without education. This is because education creates a favourable mental attitude for the acceptance of new practices especially of information-intensive and management-intensive practices (Waller *et al*, 1998; Caswell *et al*, 2001). Farm size of respondents indicated a significant positive relationship with adoption of value addition technologies of root and tuber crops. This implies that farmers with large farm size are likely to adopt a new technology as they can afford to devote part of their land to try new technology unlike those with less farm size (Uaiene *et al*., 2009). Access to extension contact helps farmers acquire relevant information that promotes technology adoption. Access to information through extension services reduce the uncertainty about the performance of a technology, therefore may change the assessment of a potential adopter from purely subjective to objective over time thereby facilitating adoption. In line with this, extension contact indicated a significant positive relationship with adoption of value addition technologies of root and tuber crops. This implies that respondents that have access to extension services are more likely to adopt value addition technologies of root and tuber crops. This also conforms to a priori expectation. Respondents' income also had a significant but negative relationship with adoption of value addition technologies of root and tuber crops. This implies that the adoption of value addition technologies of root and tuber crops did not increase the income of the respondents. This does not conform to a priori expectation. The reason could be the low level of adoption of these technologies because it is expected that the adoption of these technologies by farmers would lead to increase in income.

Table 1: Distribution of Respondents according to their level of Adoption of selected value-addition Technologies in Abia state

	Technology	Not Aware	Aware	Interest	Evaluation	Trial	Adoption	Mean	Remark
1	Processing of cassava into HQCF	36 (0)	39 (39)	10 (20)	4 (12)	0 (0)	31 (155)	1.89	Medium
2	Processing of cassava into cassava chips	49 (0)	32 (32)	9 (18)	8 (24)	0 (0)	22 (110)	1.53	Low
3	Processing of cassava into ethanol/starch	44 (0)	32 (32)	41 (82)	2 (6)	0 (0)	1 (5)	1.04	Low
4	Use of HQCF for confectionaries like bread, cake etc.	42 (0)	40 (40)	11 (22)	12 (36)	4 (16)	11 (55)	1.41	Low
5	Processing yam into yam flour	61 (0)	31 (31)	25 (50)	1 (3)	0 (0)	2 (10)	0.78	Low
6	Processing cocoyam into soup thickener	62 (0)	35 (35)	23 (46)	0 (0)	0 (0)	0 (0)	0.68	Low
7	Processing cocoyam into chips	80 (0)	8 (8)	31 (62)	0 (0)	0 (0)	1 (5)	0.63	Low
								1.14	Low

Source: Field Survey, 2016; Key: High – 5.00 – 3.33, Medium – 3.32 – 1.65, Low – 1.64 & below

Table 2: Multiple Regression Analysis showing Determinants of Adoption of Value-addition Technologies of Root and Tuber Crops in the study area

Predictor Variables	Linear	Exponential	Semi-Log	Double-Log
Constant	3.045 (0.686)	1.551 (4.417)***	15.148 (3.274)**	2.530 (6.829)***
Sex	1.530 (1.216)	0.074 (0.744)	-1.820 (-0.717)	-8.452E-006 (0.000)
Age	-0.281 (-0.438)	0.013 (0.257)	0.204 (1.278)	0.125 (0.853)
Household Size	-0.096 (-0.096)	-0.016 (-0.200)	-0.106 (-0.062)	-0.008 (-0.058)
Education	1.420 (2.660)**	0.137 (3.249)**	3.134 (2.359)*	0.296 (2.786)**
Income	-1.264 (-2.101)*	-0.141 (-2.970)**	-4.697 (-1.959)	-0.512 (-2.666)**
Farm size	1.753 (1.745)*	0.214 (2.698)**	2.329 (1.397)	0.287 (2.148)*
Farming Experience	-0.022(-0.029)	-0.011 (-0.185)	0.304 (0.185)	-0.016 (-0.118)
Ext. Contact	4.674 (3.725)***	0.358 (3.610)***	6.527 (3.531)**	0.502 (3.389)**
R^2	0.348	0.377	0.329	0.342
R^{-2}	0.295	0.326	0.274	0.288
F	6.533***	7.387***	5.988***	6.357***

Source: Field Survey, 2016; Key: * = 1% level of significance, ** = 5% level of Significance, * = 10% level of significance**

Conclusion

The study revealed lack of awareness of technologies like processing of yam into yam flour, processing of cocoyam into soup thickener, and processing of cocoyam into chips. There is generally low level of adoption of these technologies by the respondents in the study area. Furthermore, factors like education, farm size and extension contact had positive effect on adoption while income had negative effect on adoption of value addition technologies of root and tuber crops in the study area. The study call fo policies aimed at increased promotion and popularization of these technologies to increase awareness. Agricultural Development Project (ADP) and the media should reinforce the training where these trainings have been conducted previously in the state to ensure proper diffusion and increased adoption of these technologies**.**

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