Learning innovations through extension training on preparation of sweetpotato *(ipomoea batatas)* snacks among selected women in Nigeria

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Abstract

This paper examined learning innovations through extension training on preparation of sweet potato snacks among selected women in Nigeria. Stratified sampling technique was used to select three out of six (South-East, South-West, North-West) geo-political zones. Five states were selected from each geo-political zone. Qualitative (involving use of focus group discussion and In-depth interview with the female groups and female leaders) and quantitative methods of data collection were used to elicit information from the respondents.

Eight sweet potato processors were sampled and interviewed during field survey from 15 states making a total of 120 processors from three geo-political zones.. Descriptive and inferential statistics were used to analyze the data. Selected socio-economic characteristics significant in determining the level of extension training activities in sweet potato snacks' preparation across these geopolitical zones included educational level, secondary occupation of processors and benefits derived from sweet potato processing at $p \leq 0.05$ level of significance. Three main methods of disseminating sweet potato snacks production during extension training included Individual Group and mass media methods of communication.

Extension activities of the Women-In-Agriculture unit involved arrangement of literacy classes for women, identification of farming problems, advice training on home management and nutrition, provision of information and dissemination of innovative information on farming systems. In conclusion, women participating in Women-In-Agriculture programme enjoyed a number of advantages over the non-participants because they had a greater knowledge and easier access to training and technologies through Women-In-Agriculture extension agents. The Federal, State and Local governments should ensure that all agricultural Programmes include women at both planning and execution stages.

KEYWORDS: Learning innovations, Extension training, sweet potato snacks' Women, Nigeria

Résumé

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Summary of Experience: Agricultural Extensionist with specific area of expertise on Gender Dynamics in Rural Development and Rural Livelihood.

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Introduction

In Nigeria, extension has been an important unit of the Agricultural Development Project since 1988. The World Bank recognized the roles of rural women, hence encouraged the employment and training of female extension agents. During the previous two decades, a lot of attention has been drawn to the important role of rural women in agricultural production in developing countries. However, prior to the realization that rural women constitute an "economically active population", they were largely not considered productive because they usually worked as unpaid family labour (Olawoye, 1998). Women are involved in many activities relating to food production. They should therefore, be empowered economically to improve the standard of living of rural households for enhanced food security in Nigeria

Food processing by rural women

Food processing was described as any activity meant to increase the economic value of a crop by improving its consumer appeal, quality, storability, uses and availability over time and space (Okigbo, 1982).

Longe, (1985) pointed out that rural women are involved in food production, processing and preservation. According to her, food processing is necessary for reduction of wastage, conservation of food crops into forms that are acceptable to different socio-economic classes depending on their dietary habits. Sweet Sweet potato is one of the crops processed by the rural women for income generation. It has tremendous potentials for providing food for human beings. It is consumed as a part of the main meal or as a snack. It is fried into chips or roasted as whole roots. Though processed products are very attractive to customers, fresh use is the major form of utilization in Nigeria. Sweet potato is high in calorie value and its tuber can be processed into flour, which can be fortified with wheat flour and fried into puff-puff, chin-chin, cake and buns. It can also be fermented into industrial alcohol, vinegar, yeast and acetone (Scott *et al.,* 1992). It therefore has a potential of playing an important role as a food security crop and providing a variety of human food, animal feed and industrial products for empowering the low-income women producers in Nigeria. Hence, enhancing women productivity through processing of the crop will improve the chances of achieving the overall, economic and social objectives of the nation, while still increasing women's income and bringing them into the mainstream of development. This paper, therefore examined the extension activities of the Women-In-Agriculture (WIA) unit of the Agricultural Development Projects in Nigeria, aimed at assistiong low-income earning women through the intervention of sweet potato snacks.

Extension activities of the Women-In-Agriculture(WIA) unit of Agricultural Development Projects (ADP) in Nigeria

Women involvement in agriculture is significant not only in terms of labour input, but also in terms of decision-making. Despite the high involvement of WIA and other related activities, limited agricultural extension services are extended to them. Most of the extension messages have been geared towards male farmers. In Nigeria, all the ADPs have integrated the WIA component under the extension sub-programme in order to meet the need of women in all aspects of agricultural production and to increase the income and standard of living. (Ojeniyi, 1992).

Agricultural extension is an on-going process of getting useful information to people and to assist these people to acquire the necessary knowledge, skills and attitudes to use information technology effectively (Ladele and Ogunlade, 1999). The aim of the extension process is to enable people to use these skills, attitudes and knowledge to utilize information effectively in order to improve the quality of life.

The Integrated Agricultural Development Programme (IADP) led to the establishment of ADPs, which are now present in each of the thirty-six (36) states and the Federal Capital Territory of the country (Odebode, 1997). The ADPs constitute the single largest agency, charged with the responsibilities of agricultural extension services in Nigeria. The ADPs started a decade before the WIA (Women-In-Agriculture) was introduced. The Unified Agricultural Extension System (UAES) was designed to use one extension agent to bring modern technology to farmers in more than one agricultural discipline, to remove the current practice of parallel extension services. The (WIA) unit is operated under the extension departments and fully incorporated into the UAES.

The main objective of the WIA unit of the ADP is to improve the standard of living of rural women farmers in the areas of increased crop production, introduction of improved technology for food crops processing, and marketing of farm produce. Other objectives of the WIA unit of the ADP include:

- Improvement of extension services through increase in number of female extension agents.
- Introduction of improved and appropriate technology, which are labour saving and can remove drudgery, yet are affordable by the women farmers.
- Organization of women groups and encouragement of women to register as viable cooperative groups so as to have access to credit facilities.
- Introduction of newly recommended farm technologies by conducting Small Plot Adoption Techniques, SPATs, and establishing women's groups.
- Updating and up-grading the skills of WIA agents in agricultural/food production, preservation, storage, processing, utilization and nutrition.
- Training of women farmers to increase their agricultural food production income and to improve their nutritional status.
- Development of local recipes from farm produce.
- Provision of assistance to women in post-harvest technologies, and imitation of technologies that will reduce the drudgery associated with day-to-day activities of women.

Objectives of the study

The main objective of this study was to examine the extension-training programme of the WIA unit of ADP for assisting low-income earning women economically through the intervention of sweet potato snacks.

The specific objectives were:

1. To examine the socio-economic characteristics of the processors who had the training on sweet potato snacks' intervention
2. To examine the context of the extension-training programme of WIA of the ADP for assisting low-income earning women economically through sweet potato snacks intervention.

Materials and Method

Study area

The study areas were three geo-political zones-South-East, South-west, and North-Central (Table 1).

Instruments and methods of data collection

This study was conducted in three out of the six geo-political zones of Nigeria. The primary data were collected, using both quantitative and qualitative data collection methods. The secondary data were in the form of official documentation at the local government area, state and national levels. The reason

was to gain an insight into the perspectives of the local population in three states where sweet potato was being grown and consumed.
Table 1 presents the breakdown of sampled states and the number of processors surveyed, Focus Group Discussions (FGDs) and In-depth Interviews (IDIs) conducted.

The qualitative methods used in the study were:

a) **Focus Group Discussions (FGDs)**
The Focus Group Discussions (FGDs) were held with 15 women groups participating in Women-In-Agriculture activities from fifteen states. Eight (8) women processors were interviewed per group and different topics on sweet potato processing and products were raised with the assistance of a moderator per group. A total of 120 respondents were used for the FGDs in the study areas covered.

b) **In-depth Interviews (IDIs)** were conducted with the officials of the state ADPs and the women leaders. Athe interviews helped in eliciting information on sweet potato processing techniques from the ADP officials and the women leaders.

c) **Community Mapping**
The community mapping was used as a tool to provide enough and adequate information on the physical linkages of communities with sweet potato farms, rivers, roads, electricity and other infrastructural facilities.

d) **Seasonal Calendar**
The seasonal calendar helped in providing information on the activities the women were engaged in at different times, i.e. it helped in knowing the season-specific nature of their activities.

Quantitative data were collected by using an interview guide

Analytical technique

The quantitative data were summarized using the descriptive statistics and analyzed using multiple regression statistical analysis.
One hundred and twenty sweet potato processors were purposively selected from sweet potato growing states. Regression analysis was used to find out whether there was any significant association between the sweet potato processors' selected social-economic/ personal characteristics and the training received by the Women-In-Agriculture unit in Nigeria.

Results and Discussion

The results and discussion of this study are presented in table2
Table 2 shows the extension training activities of the WIA unit of ADP of Nigeria. The training activities largely included provision of information to women on sweet potato processing (46%), and home management and nutrition (13%), arrangement of literacy classes for women (13%), identification of farming problems (4%), advice on agricultural problems(8%), teaching and dissemination of innovative information (17%).
All the sweet potato processors were trained on how to process sweet potato 'spari' (roasted granules), sweet potato puff-puff and sweet potato cakes. The methods and recipes, used during the training programme, are stated in the figures.

Sweet potato cake

Materials	**Quantity**
Whole Wheat flour	350 gm
Sweet Potato flour	50 gm
Baking powder	1 Tablespoonful
Sugar	200 gm

Fat	350 gm
Eggs	4
Lemon rind	half a teaspoonful
Milk	150 ml to mix
Water	10ml

Method

- Sieve all dry ingredients together i.e. wheat flour, sweet potato flour, and baking powder.
- Add sugar to margarine and beat until mixture turns cream colour.
- Mix wheat flour, baking powder and sweet potato flour.
- Add beaten eggs in bits by degree.
- Add water little by little to mixture until the mixture is flowing consistently.
- Take two-table spoons of the dough and put into each hole of green tray.
- Bake in a moderate oven until brown.

Sweet potato puff- puff

Materials

- Wheat flour
- Sugar
- Yeast
- Sweet potato flour
- Margarine
- Vegetable oil
- Salt
- Water

Method

1) Dissolve yeast in lukewarm water for 15 minutes
2) Sieve flour in a bowl
3) Add sugar and milk
4) Add margarine to the dough and mix
5) Make a well in the centre of the bowl, add beaten egg, dissolve yeast and mix well.
6) Leave the dough to relax for 20 minutes
7) Knead the dough again, mould into small balls and put on greased baking tray.
8) Bake in a hot oven at 250^0 for 20 – 25 minutes
9) Remove from oven and cool on a wire rack. (OR) Place the thin dough (covered with a white cloth) in a warm place, for 30 minutes and fry puff-puff until golden brown.

Other Snacks produced include sweet potato chin-chin, buns and biscuits.

Age and educational distribution of respondents

Table 3 contains data on the age distribution of sampled women in years. Most of the processors in each state were middle aged. The percentages of the younger processors were small. There is the need to encourage more middle-aged women and the younger women to participate in this type of training programme. This was because a lot of financial gains was expected through the sale of sweet potato snacks.

Formal education is an important need in training through extension education. This is because literate population is easier to reach because they communicate more readily than the illiterate population. . The highest educational level among the processors was the primary school. Functional education was higher in the southern states of Nigeria than in the north-central states (Table 4).

Results of Focus Group Discussion

Agricultural Extension Services, identified during the Focus Group Discussion. The agricultural extension services identified by the respondents who were the Women-In-Agriculture Unit directors included Extension Education; retail outlets for farm supplies and equipment; market for farm products; production credits; local verification trials (research); and farm-to-market roads. This agrees with the findings of . Ladele *et al.,* (1999) concerning the services rendered by agricultural extension in Nigeria. Moreover, females in all the study areas engaged in food crop processing and selling of snacks and cooked foods.

Results of Multiple Regression Analysis

Regression analysis used for the main objective of the study includes four functional forms: linear, semi-log, double-log and exponential. These were applied to analyze the data to achieve the main objective. The functional models are as follows:

The implicit function for the regression model was

$$Y=f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, U)\mathbf{s}$$

Y = No of times respondents attended training on sweet potato processing

X_1 = Age of the sweet potato processors (in years)

X_2 = Religion of the sweet potato processors: Dummy 1= Christian 0=Muslim

X_3 = Household size of the sweet potato processors

X_4 = Marital status of the sweet potato processors: Dummy 1=Married 0=Otherwise

X_5 = Secondary occupation of the processors If farming =1; Otherwise=0

X_6 = Educational level of the processors Formal Education=1; No Formal Education=0

X_7 = Benefits of sweet potato to the processors Financial Benefit=1;Otherwise=0

X_8 = Ethnicity If Yoruba=1; Otherwise =0

U = Error term

Linear

$Y=a + b1X1 + b2X2…bnXn$

Double-Log Function

$\text{Log } Y= a + b_1 \log X_1 + b_2 \log X_2 +…+ b_n \log X_n + u$

Semi-Log Function

$Y= a + b_1 + \log X_1 + b_2 \log X_2 +. . .+ b_8 \log X_n + u$

Exponential Function

$\text{Log } Y= a + b_1 X_1 + b_2 X_2 +. . .+ b_n X_n + u$

The model that provides the best fit was chosen for further discussion on the basis of the following:

- The magnitude of the coefficients of multiple determination (R^2),
- The magnitude and statistical significance of the regression coefficients,
- Signs of the regression coefficients as they conform to a priori expectation.

R^2 is a measure of goodness of fit of the regression model. A high R^2 is an evidence of a good regression analysis. Standard error of regression estimate is the unexplained variation in the variability of the dependent variable. The smaller the standard error of estimate, the better the regression estimate; t-test determines the significance of individual coefficient in the function. t-test measures the overall significance of the model. If F calculated is significant at 1%, 5% or 10%, the regression is a good fit. The signs of the regression coefficient show the importance of each variable in determining the level of extension training activities of the respondents.

Semi-logged model was the best fit for the regression analysis. Results show that there is a significant relationship between the level of extension training and some selected personal characteristics of sweet potato processors at 5 percent level of probability. R^2 is 0.141, which shows that the variation in the level of training is explained by the 14% of the independent variables. Education exercised the greatest influence in the prediction of the dependent variable by the independent variables with a beta value of 0.2136 ($t = 2.0294$, $p \leq 0.05$). This shows a positive and significant relationship with the dependent variable. This indicates that, if the women have a high level of education, it will improve the level of training in extension activities. This is because formal education is one of the powerful tools in the teaching-learning process. Hence, the higher the education, the higher the level of understanding of extension training activities.

The next contribution to the level of extension training programme was secondary occupation ($t = 1.152$, $p \leq 0.05$). This shows a positive and significant relationship with the dependent variable. Those who had secondary occupation also gained from the extension training activities. This shows that secondary occupation reinforces the training on sweet potato processing. Benefits derived from sweet potato processing was positively and significantly related to training ($t = 1.052$, $p \leq 0.05$). Women responded well to training in accordance to perceived benefits from the exercise. Age ($t = 2.252$, $p > 0.05$), religion ($t = 0.628$, $p > 0.5$), marital status (-1.023, $p > 0.05$) and ethnicity (-2.252, $p > 0.05$) were negatively related to the dependent variable; hence did not contribute to the variable in the level of sweet potato training. The results further show that age, religion, marital status, and ethnicity had no influence on the extension training activities of the respondents on sweet potato. The regression analysis of the relationship between the selected demographic characteristics and level of extension training in the Women-In-Agriculture unit of Agricultural Development Programmes in Nigeria showed that 14% of the variance in the level of training could be explained by the selected demographic characteristics.

Information on seasonal calendars in all the states

The seasonal calendars in all the states are stated below:

Variation exists in some zones especially in the drier north. Problems, identified by the sweet potato processors during the focus group discussion in order of severity included lack of capital; lack of control over land; food insecurity, lack of market; bad roads; irregular visit by extension agents. Income generated from the training would have been a significant variable as well as the income from the secondary sources

Extension Teaching MethodsUsed during Learning Innovations in sweetpotato snacks preparation

Extension teaching methods are ways or means of passing new innovation or information freely to rural farm communities.. The methods used in disseminating learning innovations to sweet potato snacks producers(women) include Individual contact method,group contact method and mass media method. However, the group contact method was used most of the time and it seemed the most effective method especially during the training period.

Conclusions and Recommendations

The main conclusion of this study was that the Women-In-Agriculture unit of Agriculture Development Programme in Nigeria provided the following services to farmers in Nigeria: extension education, retail outlets for farm supplies and equipment, market for farm products, production credits,

local verification trials (research) and farm to market services. The level of extension training in the activities on sweet potato processing involved in by the Women-In-Agriculture programme did not depend on the sweet potato processors' age, religion, household size, marital status and ethnicity. Rather training was significantly influenced by education, secondary occupation and benefits derived from training by trainees.

The sweet potato products, which the Women-In-Extension taught processors how to prepare included sweet potato puff-puff, chin-chin, and buns. The policy promoting women education should be encouraged since education had a positive effect in the training of sweet potato processors in Nigeria. Furthermore farming activities should be encouraged since it had a positive influence on the sweet potato processors' training.


Fig. 1 Typical Women Training Programme in a Nigerian Community

Fig 2.Sweet potato Cake

Fig 3 Sweet potato puff-puff

Fig. 5 Sweet potato flour

Fig. 4 Sweet potato chin-chin

Table 1 Distribution of sweet potato processors according to geo-political zones and states.

Geo-political Zones	State	ADP Selected	WIA Directors	Processors Interviewed	ADP Location	FGDs Female	IDIs	IDIs, WIA Officials
South East	Imo	Imo	1	8	Owerri	1 group	1	1
	Anambra	Anambra	1	8	Oka	1 group	1	1
	Abia	Enugu	1	8	Enugu	1 group	1	1
	Enugu	Abia	1	8	Umuahia	1 group	1	1
	Ebonyi	Ebonyi	1	8	Abakaliki	1 group	1	1
South West	Lagos	Lagos	1	8	Ikeja	1 group	1	1
	Ogun	Ogun	1	8	Abeokuta	1 group	1	1
	Oyo	Oyo	1	8	Ibadan	1 group	1	1
	Osun	Osun	1	8	Osogbo	1 group	1	1
	Ekiti	Ekiti	1	8	Ado-Ekiti	1 group	1	1
	Ondo							
	Edo							
North Central	Benue	Kwara	1	8	Ilorin	1	1	1
	Kogi	Kogi	1	8	Lokoja	1	1	1
	Kwara	Benue	1	8	Makurdi	1	1	1
	Niger	Plateau	1	8	Jos	1	1	1
	Kaduna	Nassarawa	1	8	Lafia	1	1	1
	Plateau							
	Nassarawa							
	19	**15**	**15**	**120**	**15**	**15**	**15**	**15**

Table 2 Distribution of Respondents Based on the Extension Activities of the WIA

Extension Activities of the Women-In-Agriculture Unit		Frequency	Percentage
1.	Arrangement of literacy classes for women	15	13.0
2.	Identification of farming problems	5	4.0
3.	Advice on agricultural problems	10	8.0
4.	Training on Home Management and Nutrition	15	13.0
5.	Provision of information to women	55	46.0
6.	Teaching and dissemination of innovative information	20	16.0
	TOTAL	120	100

Table 3 Distribution of sweet potato processors by age.

	State	20-29	30-39	40-49	50-59	60 and above	MEAN AGE
1	Imo	1 (12.5)	5 (62.0)	2 (25.0)	–	–	37.75
2	Anambra	2 (25.0)	4 (50.0)	1 (12.5)	1 (12.5)	–	35.75
3	Enugu	1 (12.5)	6 (75.0)	1(12.5)	–	–	34.50
4	Abia	–	3 (37.5)	3 (37.5)	1 (12.5)	1 (12.5)	40.75
5	Ebonyi	–	5 (60.5)	2 (25.0)	–	1 (12.5)	40.75
6	Lagos	–	4 (50.0)	3 (37.5)	–	1 (12.5)	42.00
7	Ogun	–	6 (75.0)	1(12.5)	1 (12.5)	–	31.44
8	Oyo	–	5 (62.5)	2 (25.0)	1 (12.5)	–	39.50
9	Osun	–	6 (75.0)	1 (12.5)	1 (12.5)	–	38.25
10	Ekiti	–	5 (62.5)	2 (25.0)	1 (12.5)	–	39.50
11	Kwara	–	7 (87.5)	1 (12.5)	–	–	35.75
12	Kogi	2 (25.0)	4 (50.0)	1 (12.5)	–	1 (12.5)	35.19
13	Benue	1 (12.5)	3 (37.5)	2 (25.0)	2 (25.0)	–	40.75
14	Plateau	2 (25.0)	5 (62.5)	1 (12.5)	–	–	33.25
15	Nassarawa	1 (12.5)	6 (75.0)	–	–	1 (12.5)	37.0

Source: Field survey
Mean Age = 37.48
All states * figures in parentheses are percentages.

Table 4 Distribution of sweet potato processors by education

	State	Non-formal education	Functional literacy	Primary education	Secondary education	Islamic education	
1	Imo	-	4 (50.0)	2 (25.0)	–	2(25.0)	8 (100.0)
2	Anambra	–	6 (75.0)	1 (12.5)	1 (12.5)	–	8 (100.0)
3	Enugu	–	4 (50.0)	3 (37.5)	1 (12.5)	–	8 (100.0)
4	Abia	1 (12.5)	5 (62.5)	1 (12.5)	1 (12.5)	–	8 (100.0)
5	Ebonyi	–	4 (50.0)	1 (12.5)	3 (37.5)	–	8 (100.0)
6	Lagos	1 (12.5)	5 (62.5)	1 (12.5)	1 (12.5)	–	8 (100.0)
7	Ogun	2 (25.0)	3 (37.5)	2 (25.0)	1 (12.5)	–	8 (100.0)
8	Oyo	4 (50.0)	2 (25.0)	1 (12.5)	1 (12.5)	–	8 (100.0)
9	Osun	4 (50.0)	2 (25.0)	1 (12.5)	1 (12.5)	–	8 (100.0)
10	Ekiti	3 (37.5)	2 (25.0)	2 (25.0)	1 (12.5)	–	8 (100.0)
11	Kwara	5 (62.5)	1 (12.5)	1 (12.5)	1 (12.5)	–	8 (100.0)
12	Kogi	5 (62.5)	2 (25.0)	–	1 (12.5)	–	8 (100.0)
13	Benue	4 (50.0)	2 (25.0)	1 (12.5)	–	1 (12.5)	8 (100.0)
14	Plateau	3 (37.5)	1 (12.5)	1 (12.5)	3 (37.5)	–	8 (100.0)
15	Nassarawa	3 (37.5)	1 (12.5)	–	1 (12.5)	3 (37.5)	8 (100.0)

Table 5 Linear regression result of factors affecting the level of extension training activities of sweet potato processors of the WIA of the ADPs.

Variable	B-Coefficient	t- value	Standard Error	Remark
X_1 Educational level	0.2136	2.0294	0.021	S
X_2 Age of respondent	-0.952	-2.252	.423	NS
X_3 Religion	-0.483	-0.628	.769	NS
X_4 Household size	0.066	0.669	0.053	NS
X_5 Marital status	-0.099	-1.023	0.210	NS
X_6 Secondary occupation	0.0640	1.152	0.052	S
X_7 Benefits derived from sweet potato processing	0.817	1.054	0.781	S
X_8 Ethnicity	-0.952	-2.252	.4233	NS

$R^2 = 0.141$; Adjusted $R^2 = 0.376$ NS = Not Significant; S = Significant at 0.05

Table 6 Seasonal calendars of farming / processing activities of sweet potato processors in studied geo-political zones.

Month	**Farming activities**		
	South-East	South-West	North-Central
January	Land preparation	Land preparation	Land preparation
February	Land clearing	Land clearing ,Processing	Land clearing / Ridge making
March	Ridge making / Planting of Sweet potato	Ridge making / Planting of Sweet potato	Planting of Sweet potato vines
April	Weeding, planting of Sweet potato vines, Processing	Weeding, Planting of Sweet potato vines	Weeding
May	Weeding	Weeding	Weeding
June	Harvesting of Sweet potato	Harvesting of Sweet potato	Harvesting of Sweet potato root
July	Harvesting of Sweet potato, Processing	Harvesting of Sweet potato	Harvesting of Sweet potato root continues
August	Planting of Sweet potato vines	Planting of Sweet potato vines processing	Planting of Sweet potato vines
September	Weeding / Harvesting of	Weeding / Harvesting of	Planting of Sweet potato vines

	other crops	other crops	
October	Weeding of Sweet potato plot/land	Weeding of Sweet potato plot/land Processing	Weeding of Sweet potato plot/land
November	Harvesting of Sweet potato root, Processing	Harvesting of Sweet potato root, Processing	Weeding of Sweet potato plot/land
December	Harvesting of Sweet potato / Land clearing	Harvesting of Sweet potato / Land clearing	Harvesting of Sweet potato / Land clearing

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