Challenges to Soil Erosion Control Measures among Farmers in Anambra State, Nigeria: Implications for Extension Policy

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The study investigated challenges to soil erosion control measures among farmers in Anambra State, Nigeria. Purposive, multistage and random sampling techniques were employed in selecting a sample size of two hundred and forty (240) respondents. Structured interview schedule was used for data collection. Frequency counts, percentage, mean scores and factor analysis were used for data analysis. The findings show that majority (54.6%) of farmers were within the ages of 40-59 years, while majority (57.9%) had either FSLC or WASE/ SSCE/ GCE/ O/L qualifications and 67.5% had estimated annual income of ₦51, 000.00- ₦200,000.00. The farmers reported that the major soil erosion control measures used were strip cropping (M=4.9) and making of ridges across slopes (M =4.8). The study revealed that the respondents were highly constrained by poor group affinity, lack of government support and inadequate institutional support. The study highlighted participatory extension policy through improved group mobilization; improved budgetary allocation to the local government and institutional re-orientation and synergy between the Ministry of Agriculture (MOA), Research institutes and Universities with the ADP. In conclusion, success in soil erosion control under the Anambra State ADP and participatory extension policy among farmers groups for food security in Nigeria depend on the extent issues raised and challenges thereof highlighted can be addressed.

Key words: Farmers, Erosion Control, Extension Policy, Nigeria

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1. Introduction

Environmental sustainability, group participation and food security are fundamental millennium development goals (MDGS) in Nigeria. These related and desirable issues under the MDGS are immense for development in any viable economy. According to Negedu (2007), the most effective strategy in attaining MDGs by 2015 is to employ integrated approach in pursuing the goals. One major area with prospects in integrated approach to MDGs in Nigeria is Agriculture sub-sector of the economy (Negedu, 2007). Agriculture plays leading roles in food security and poverty eradication for sustainable MDGs in Nigeria. In realization of the foregoing roles of agriculture in national growth and associated MDGs successive government administrations in Nigeria since political independence in 1960 have initiated Agricultural based development policies and programmes.

Some of these programmes include: ministry of Agriculture (MOA) (1968), National Accelerated Food Production Project (NAFPP) (1972) and Agricultural Development Programmme (ADP) (1972-1975). Others include: Operation Feed the Nation (OFN) (1975), Green Revolution (GR) (1980), Directorate of Food, Roads and Rural Infrastructure (DFRRI) (1986), and National Agricultural Land Development Agency (NALDA) (1992). However, some of the foregoing policies and programmes were mere food production intervention with definite life span but the ADP has persisted basically because of its enduring tenets of operation (Ayichi 1994; Madukwe, 1996). Thus, some viable extension policies namely; unified extension policy (UEP) (1989), participatory extension approach (PEA) (1990) and National Fadama Development Project (NFDA) (1992) have been incorporated into extension service to sustain the ADPs in Nigeria (Asiabaka, 2007). According to Okwu and Ejembi (2001), participatory extension approach is employed to work with farmers as important stakeholders needed to boost food production in Nigeria. The question is to what extent have these government efforts on development policies and agricultural production initiatives yielded the desired results in

terms of providing control measures for soil erosion in order to ensure adequate supply of food?

Consistent with high expectation from agriculture sector, extension must assume leading roles for attainment of the MDGs in helping to control soil erosion in an agrarian economy. The most functional extension approach to agricultural and rural development in Africa hinges on participatory policy based on philosophy of collectivism by use of representatives from organized groups (Agbamu, 2006). Under the various government agricultural extension supported policy initiatives on agricultural production under the ADPs in Nigeria, land is a critical natural resource for food security with prospects. Utomakili and Abolagba (1996) noted that land is the scarcest natural resource in agricultural production. The authors blamed worsening unproductive situations of available land space on soil erosion as a major limitation to sustainable agricultural production in most farm lands in Nigeria, especially Anambra State. Oti (2002) added that soil erosion ranks highest and most devastating problems threatening large population of Nigeria and in particular Anambra State to situations of food insecurity. Thus, soil erosion is the most severe hazard affecting the lands of Nigeria and Anambra State in particular ravaging all of its bio-climatic regions (Ofomata, 1984; Anon, 1988; Oti, 2002). Evidently, soil erosion is of various enormities in different agro-ecological zones but it is more serious in Anambra State than any other state in the Southeast zone of Nigeria.

In Anambra State, gully and sheet erosion have been most rampant (Anyanwu, 1991). According to Okafor (1991), the prevalent ecological features of steep slopes, high rainfall and sandy ferralitic soil increase susceptibility of Anambra State terrain to erosion. These erosion problems have either resulted in gradual loss of essential surface and nutrients or complete removal of arable part of the soil (Ofomata, 1987). It was the enormity of the erosion problems and the futility of existing agencies to partner effectively with the ADP that compelled the government to establish the Anambra State Task Force on Soil Erosion Control (ASTFSEC) in 1986 (Okoye, 2001). Efforts made by ASTFSEC in 1990 in soil erosion control yielded desirable results in identifying over 530 severe gully erosion sites in parts of the state where farmers were encouraged to imbibe aforestation as a measure of soil conservation.

The foregoing efforts on soil erosion control are commendable but situations of devastation of erosion on farm land resulting in inadequate agricultural production to match the teeming population in Anambra State, Nigeria have persisted despite huge human, material and financial resources invested. The Anambra State ADP has not addressed necessary challenges to achieve sustainable result. The ADP in the state does not seem to have addressed necessary practices to stimulate sufficient participation among the farmers. Desirable participation among farmers in soil erosion control would involve agricultural extension policy with practices compatible with existing knowledge and socio-economic conditions needed to stimulate participation among farmers.

This therefore raises the following pertinent questions. What are the socio-economic characteristics of farmers in Anambra State? What are the soil erosion control measures practiced by farmers in Anambra State? What constraints limit soil erosion control among farmers in Anambra State? What specific lessons could be learned from soil erosion control measures used by the farmers under the Anambra State? And what are the challenges for participatory extension policy?

The overall purpose of the study was to investigate soil erosion control measures among farmers in Anambra State, Nigeria.

Specifically, the objectives were to; describe socio-economic characteristics of farmers in Anambra State; ascertain soil erosion control measures practiced by farmers in Anambra State as well as knowledge levels on the control measures; identify constraints to soil erosion control in Anambra State and highlight challenges to participatory extension policy among farmers.

2. Materials and methods

The study was carried out in Anambra State, Nigeria. The state is made up of four agricultural zones namely; Anambra, Awka, Aguata and Onitsha. The primary occupation of people in the state is farming. Over 70% of farm land in the state is ravaged by various forms of soil erosion. Contact farmers and non-contact farmers of ADP constituted the population for the study. Purposive, multistage and random sampling techniques were employed in data collection. Two out of three ADP zones namely, Awka and Aguata were purposively selected for the study because of proximity and intensity of agricultural production as well as being prone to soil erosion. Two blocks were selected purposively from each of the zones. Thus, Aniocha and Njikoka were selected from Awka, while Orumba North and Orumba South were selected purposively from Aguata zones, respectively. From each of the blocks selected, 2 circles each were randomly selected. Then, from the selected circles, 2 villages were further selected randomly, while from each of the villages involved, 15 farmers were randomly

selected, giving a total of two hundred and forty (240) respondents for the study.

A structured interview schedule for farmers was developed, validated and employed for data collection. The interview schedule reflected issues on specific objectives of the study. Statistical Package for the Social Science (SPSS) software version 6 was used for the analysis. Descriptive statistics such as frequency counts, percentage, mean scores and factor analysis techniques were used for data analysis. The exploratory factor analysis techniques using the principal factor model with interactions and varimax rotation was adopted. The factor loading under each constraint (beta weight) represent a correlation of the variables (constraint areas) to the identified constraint factors and has the same interpretation as any correlation coefficient. Kaisiers criterion using factor loading of 0.30 and above in naming and interpreting the factors and constraint variables was adopted.

3. Results and discussion

Socio-economic characteristics of the respondents:

Data in Table 1 show that majority (54.6%) of farmers were within the ages of 40-59 years with mean age of 40 years, while majority (76.7%) were males. The study indicates that most farmers covered were adults within the active ages which could predispose them to participating in soil erosion activities in the study area. However, the Anambra State ADP had limited involvement of women (23.3%) and youths (29.2%) in controlling erosion in the study area. Studies by Mbanefo (1990), Uwakah, Uwaegbute and Madukwe (1991) have recommended that any effort on agricultural transformation including soil erosion control must involve meaningful population of women as crucial labour force to achieve the desired objectives. Furthermore, about 49% of the farmers were married, while 60.5% had household size of 6-15 members with mean household size of 8 members. Majority (66.3%) of the farmers had farm holdings of 0.6-2 hectares with mean farm size of 1.4 hectares. The study indicates that most farmers were married and are small holder farmers. However, the marital statuses and household sizes are related socio-economic variables which could serve as driving forces towards participation in soil erosion control activities needed to meet household agricultural production needs. Examined against the intensity of labour requirement of soil erosion control, the study indicates inadequate family labour for meaningful impacts on agricultural production. The findings of the study agree with Asiabaka (2008) who recommended group participation as a critical element of a viable agricultural extension policy needed for development initiatives.

Table 1 also shows that majority (57.9%) of the farmers had either FSLC or WASC/SSCE/GCE/O/L qualification, while 53.8% was full time farmers. The study indicates inadequate level of western education among the farmers. This scenario could influence negatively group participation and comprehension of relevant information on soil erosion control among farmers. The study therefore agrees with Blum (1991) and Madukwe (1995) who reported education as a facilitating factor in any agricultural enterprise including those related to soil erosion control and land resource management. Thus, the higher the educational attainment among farmers, the more favourable their disposition towards group cohesion and participation in modern soil erosion control measures. However, majority (68.8%) of the farmers reported that they belonged to various social organizations, while 58.4% of them had farming experience of 11-25 years and mean farming experience of 16 years. This situation indicates that farmers are more knowledgeable in soil erosion problems and probable local control practices. This situation requires adequate efforts of Anambra State ADP in stimulating group participation among the farmers through employment of group dynamics which manifest in social interaction among farmers in social organizations (Swanson, Rolling and Jiggins, 1984).

Furthermore, Table I shows that majority (61.4%) of the farmers reported estimated annual income of ₦ 101, 000.00 – ₦ 200,000.00 and a mean annual income of ₦ 124,390.00. Estimated annual income of a farmer is the income earned from his farm enterprise which is the excess revenue and value of household output over cost (Alimi, 1991). Examined against the backdrop of this study, farmers seem to have low annual income. This scenario could make the farmers to rely on personal savings for capital intensive farm investment and land resource management such as soil erosion control.

Soil erosion control measures practiced farmers:

Data in Table 2 show that out of eighteen soil erosion control measures implemented as strategies by the Anambra State ADP, the farmers reported appreciable awareness in construction of diversion ditch (54.2%), mixed cropping (51.3%) and strip cropping (50.0%). These soil erosion control techniques no doubt, could be associated with age long traditional soil/ land management practices of the farmers in Anambra state. This scenario underscores the need for soil erosion control activities under the Anambra state ADP to be

anchored on the existing land management practices in order to stimulate desirable participation among the farmers. Other soil erosion control measures include: tie ridging (48.8%), sod water ways (47.1%), graded bond (43.8%), grass strip (42.1%), wind break (40.8%) and mulching (40:4%). However, these levels of awareness among farmers in soil erosion control could be influenced by their contacts with extension agents under the Anambra state ADP. The situation calls for Anambra State ADP to employ adequate extension contacts and involve existing land management practices necessary in achieving desirable participation among farmers in order to control soil erosion.

Table 2 shows that the farmers indicated good knowledge of six soil erosion control measures (M=3.0). These specific soil erosion control measures include; strip cropping (M= 4.9), mixed cropping (M= 4.8), tie ridging (M= 3.9), sod water ways (M = 3.8), construction of diversion ditch (M=3.7) and sifting cultivation (M = 3.4). It could be deduced from this result that these measures which farmers have good knowledge of are possibly related to their traditional land management practices and soil erosion control techniques. This study agrees with Igbokwe and Okoye (2000), who reported that farmers in Nigeria are knowledgeable on soil erosion control practices that have relationship with soil management techniques common in their areas. This situation highlights the role of the Anambra state ADP to involve indigenous practices in order to enhance comprehension and stimulate participation among farmers for sustainable soil erosion control in the state. With the group mean of 2.7, it is obvious that most farmers lack appreciable knowledge on soil erosion control under the Anambra State ADP. Considering that the state is prone to severe soil erosion, the situation demands group approach in the extension contacts of the Anambra State ADP to expand learning opportunities and improve participation among farmers using groups.

Constraints to soil erosion control under Anambra State ADP:

Results in Table 3 show the varimax rotated factors perceived by farmers as constraints on soil erosion control under the Anambra State ADP. Based on specific issues and items loading, three major factors were extracted namely; factor 1, poor group affinity; factor 2, lack of government support and factor 3, inadequate institutional support.

Specific issues which loaded high under poor group affinity include, lack of good rural leadership (0.66), intra-community conflicts (0.49) and unavailability of social groups for extension training (0.47). Others include: low empathy towards self-help soil erosion (0.46), insensitivity of farmers towards group activities (0.40), farmers' apathy towards soil erosion control (0.38) and poor government land policy (0.31). Good rural leadership is fundamental to peace and harmony in any community. Good leadership propels mutual co-existence in social groups and this could stimulate farmers for group approach to extension training on soil erosion control.

Furthermore, low empathy towards self-help could be blamed on farmers' apathy towards soil erosion control and associated insensitivity towards group activities all of which amplify the constraint of poor group affinity in soil erosion control. Equally, the poor government policy could limit accessibility of farmers to land and affect their overall affinity within groups for desirable self-help efforts on soil erosion control under the Anambra State ADP.

Table 3 also reveals lack of government support and the scenario depicts weakness on the part of government in providing enabling environment and facilities to enhance soil erosion control among farmers under the Anambra State ADP. According to Negedu (2007), the effectiveness of agricultural extension depends on the extent it is supported and strengthened to serve the farmers. Specific issues which amplified lack of government support include lack of rural infrastructure (0.53), varying topography of farm environment (0.45) and non-recognition of social groups (0.44). Others include: lack of credit facilities (0.43), inadequate fund for social groups (0.42), inadequate support to ADP (0.39) and inadequate research extension farmer linkages (0.30).

Lack of rural infrastructure worsen the varying topography of farm environment and this scenario could affect negatively recognition of social groups as contact groups in rural communities under the Anambra State ADP. This study therefore corroborates with Eze (2000) who identified inadequate rural infrastructure as a factor limiting contacts with farmers in Southeast, Nigeria. Also, lack of credit facilities and inadequate funding revealed by this study could negatively affect empowerment of social groups and availability of farmers for extension training on soil erosion control under the Anambra state ADP.

Factors which loaded high under inadequate institutional support include: land management problems (0.50), multiple local cropping pattern among farmers (0.48) and lack of information on soil erosion control (0.41). Other inadequate institutional support issues include incompatibility of ADP with indigenous process (0.37), incomprehension of soil erosion control techniques (0.36), inadequate co-operation among members of social organization (0.34) and inadequate extension contacts (0.32).

Table 1. Percentage distribution of respondents according to socio-economic characteristics (n=240)

Variable	Frequency	Percentage (%)	Mean Score (M)
Age (years)			
≤ 29	55	22.9	
30 – 39	42	17.5	40
40 – 49	91	37.9	
50 – 59	40	16.7	
60 years and above	12	5.0	
Sex			
Male	184	76.7	
Female	56	23.3	
Marital status			
Married	117	48.8	
Single	70	29.2	
Widowed	53	22.1	
Household size (number)			
≤ 5	75	31.3	
6 – 10	93	38.8	
11 – 15	52	21.7	
16 and above	20	8.3	8
Farm holdings (hectare)			
≤ 0.5	36	15.0	
0.6 – 1	84	35.0	
1.5 – 2	7.5	31.3	
2.5 – 3	30	12.5	
3.5 and above	15	6.3	1.4
Level of education (years)			
No formal education	20	8.3	
FSLC	5 4	22.5	
WASC/SSCE/GCE O/L	85	35.4	
OND/NCE	38	15.8	
HND/BA/BED/BSC	27	11.6	
MSC/MA/MED/MBA, above	16	6.7	
Primary occupation			
Full time farming	129	53.8	
Trading	53	22.1	
Artisan	22	9.1	
Civil service	35	14.6	
Farming experience (years)			
≤5	20	8.3	
6 – 10	45	18.8	
11 – 15	46	19.2	
16 – 20	54	22.5	
21 – 25	40	16.7	16
26 and above	35	14.6	
Membership of social organization			
Chairman	15	6.3	
Secretary	21	8.8	
Financial Secretary	19	7.9	
Provost	20	8.3	
Ordinary member	165	68.8	
Estimated Annual income (₦)			
≤50,000.00	26	10.8	
51,000.00 – 100,000.00	44	18.3	₦ 124,390.00
101,0000.00 – 150,000.00	64	26.7	
151,0000.00 – 200,000 .00	82	34.7	
201,0000.00 and above	24	10.0	

Table 2. Percentage and mean knowledge levels of farmers on soil erosion control under the Anambra state ADP

Soil erosion control measures	Percentage (%)(N = 240)	Knowledge level mean (Max = 5)
Strip cropping	50.0	4.9
Wind break	40.8	2.5
Use of organic manure	36.3	2.2
Gross strip	42.1	2.3
Stone terrace	30.0	1.6
Contouring	27.1	2.1
Mixed cropping	51.3	4.8
Tie ridging	48.8	3.9
Mulching	40.4	1.1
Graded bond	43.8	2.3
Construction of diversion ditch	54.2	3.7
Construction of ridges across slopes	31.3	2.6
Sod water ways	47.1	3.8
Concrete bonds	39.2	2.3
Land smothering	12.9	1.8
Earth dam	34.6	2.3
Shifting cultivation	38.3	3.4
Strip terracing	23.3	2.0
Group mean		2.7

Table 3. Factor analysis of farmers' perceived constraints on soil erosion control

Constraints	Factor 1 (Poor Group affinity)	Factor 2 (Lack of Government support)	Factor 3 (Inadequate Institutional s support)
Poor government land policy	0.31	0.12	0.06
Inadequate fund to social groups	-0.22	0.42	0.03
Lack of information on soil erosion control	0.25	0.02	0.41
Intra-community conflicts	0.49	0.06	- 0.28
Inadequate research extension farmer linkages	- 0.35	0.30	0.18
Lack of good rural leadership	0.66	0.01	-0.14
Inadequate support to ADP extension services	0.11	0.39	0.26
Inadequate co-operation among members of social organizations	0.01	0.20	0.34
Unavailability of social groups for extension training	0.47	0.03	0.06
Farmers' apathy towards soil erosion control	0.38	0.09	0.19
Inadequate extension contacts	0.28	- 0.30	0.32
Non-recognition of social groups on the part of govt.	0.20	0.44	0.19
Land management problems	0.13	- 0.06	0.50
Insensitivity of farmers towards group activities	0.40	-0.02	0.11
Lack of credit facilities	0.24	0.43	- 0.05
Low empathy towards self-help soil erosion control	0.46	0.02	0.13
Lack of rural infrastructure	0.03	0.53	- 0.40
Incompatibility of ADP with indigenous process	0.06	0.10	0.37
Incomprehension Among farmers	0.04	- 0.32	0.36
Multiple local cropping pattern among farmers	0.05	0.03	0.48
Varying topography of farm environment	-0.13	0.45	0.15

The multiple local cropping patterns among farmers could be blamed on land management problem and this scenario is worsened by lack of information on soil erosion control occasioned by inadequate extension contacts under the Anambra State ADP. This study therefore, agrees with Alimi (1991) who identified land as a critical resource in agriculture and noted land ownership as fundamental to land management. Consequent upon the foregoing, land management could exert significant influence on agriculture production and food security in Nigeria. Moreover multiple local cropping patterns among farmers have been associated with degradation and soil erosion in Nigeria (Daudu, Onyibe, Jibrin and Adegbehin, 1999). Similarly, incomprehension of soil erosion control techniques among farmers could be attributable to incompatibility of extension activities with the indigenous process under the Anambra State ADP. Thus, the more the Anambra State ADP could involve in indigenous process the greater the farmers' comprehension for more sustainable soil erosion control in the State.

Challenges for participatory extension policy among farmers:

There could be a consensus that various government administrations in Nigeria have made conscientious efforts towards attaining food security and MDGs. These efforts have focused on establishment of various food intervention and policy programmes as well as issues relating to environmental sustainability. However, the extent of goals attainment is doubtful in terms of meaningful synergy among relevant institutions and participation among farmers in addressing severe problems of soil as a critical aspect of land resource management in agricultural production. The desirable land resource management has been ravaged by soil erosion occasioned by prevalent ecological features of steep slopes and sandy ferralitic soil resulting in loss of essential arable surface, nutrients, and low yield. This study anchored in participation among farmers as fundamental in achieving sustainable soil erosion control. Hence, three constraints namely poor group affinity, lack of government support and inadequate institutional support were identified as limiting participation among farmers in soil erosion control under the Anambra State ADP. The envisaged participation has challenges for participatory extension policy among farmers groups and food security in Nigeria.

Examined against the backdrop of this study and the envisaged participatory extension policy has challenges to government in involving conscientious efforts as needed to harmonize activities in existing and emerging social groups and stimulate linkages between relevant institutions. The envisaged efforts of the government have challenges on improvement in budgetary allocation in order to elicit necessary agricultural research and extension training in soil erosion control under the ADP. The envisaged improvement in budgetary allocation demands emphasis on critical infrastructure, credit and support funding in order to make extension training and delivery in soil erosion control more efficient under the ADP as grassroots oriented organization. The foregoing situation require government support for workable relationship between formidable organizations namely, Ministry of Agriculture (MOA), Research institutes, credit institutions and universities with the ADP. The desirable relationship has challenges for institutional re-orientation among relevant institutions to improve agricultural production and environmental conservation using the ADP as the implementing arm. The situation demands concentration of efforts among relevant institutions on developing relevant technologies and primary production as well as foster interest with farmers as stakeholders through strong synergy with the ADP. The envisaged synergy involves organizational overhaul in the Anambra state ADP to involve effective participatory extension delivery policy. The envisaged participatory extension policy also involves necessary extension methodology to narrow the communication gap between research in developing soil erosion control techniques and farmers who are the recipient of soil erosion hazards.

Again the envisaged extension methodology and participatory policy demand the Anambra State ADP to provide improved staff skills and re-orientate their attitudes towards natural land resources management. Moreover, the envisaged improved staff skills under the Anambra state ADP has challenges of harmonization and co-operation between the ADP and existing as well as emerging social organizations. The envisaged harmonization and co-operation has challenges to the ADP to orientate and focus extension contacts on farmers groups, group mobilization and land resource management. The desirable group mobilization in soil erosion control and land resource management has challenges to the Anambra State ADP to involve group dynamics and indigenous process. The envisaged involvement of group dynamics and indigenous process has challenges to the Anambra State ADP in working with existing rural leaders as well as emerging social organizations to overtly overhaul and restructure them. This scenario will serve as strategy to improve group leadership and make the farmers truly participatory in soil erosion control. Moreover, the restructuring process in social organizations has challenges to the farmers to work in groups and involve self-help efforts in soil erosion control under the Anambra State ADP. This desirable participatory extension approach and policy has challenges to the farmers groups in negotiating their interests, accessing existing credit and supporting infrastructure for improved Agricultural production output and food security in Nigeria.

4. Conclusion and Recommendations

Soil erosion control is fundamental to environmental sustainability and attainment of MDGs of increases agricultural productivity. Results of the study indicate that the Anambra State ADP adapt strategies to control soil erosion devastation and loss of essential surface, nutrients, removal of arable soil and low agricultural production. However, the enormity of soil erosion devastation and attendant low agricultural production are blamable on lack of participation among farmers groups in soil erosion control. The scenario is attributed to critical constraints namely, poor group affinity, lack of government support and inadequate institutional support. The constraints were highlighted to

challenge participatory extension policy among farmers groups and food security in Nigeria. These challenges were highlighted on improved government budgetary allocation and support to the ADP, institutional re-orientation and harmonization in farmers. These challenges constitute serious participatory extension policy issues to consider for sustainable soil erosion control and improved output in agricultural production under the Anambra State ADP. The study recommends synergy between the Anambra State MOA, research institutes and universities with the ADP as well as harmonized social organizations. Others include government budgetary provisions on critical infrastructure, organizational overhaul, involvement of social dynamics and rural leadership and extension contacts in groups with emphasis on group resource mobilization. Success in soil erosion control among farmers under the Anambra State ADP depend to a large extent on issues raised and challenges thereof highlighted can be addressed.

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