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CLIMATE-SMART AGRICULTURAL PRACTICES ADOPTED BY INTERNALLY DISPLACED PERSONS IN MAKURDI LOCAL GOVERNMENT AREA, BENUE STATE, NIGERIA

Samuel Terzungwe Ikima, Johnson Orfega Mage and Aondona Dzer
Department of Geography, Rev. Fr. Moses Orshio Adasu University, Makurdi, Nigeria

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***Corresponding Author:** Samuel Terzungwe Ikima
Department of Geography, Rev. Fr. Moses Orshio Adasu University, Makurdi, Nigeria
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ABSTRACT

This study examined the climate-smart agricultural practices adopted by internally displaced persons (IDPs) in Makurdi Local Government Area of Benue State, Nigeria. A survey design involving questionnaire administration and field observation was used to obtain information from 393 IDPs drawn from four camps: Mbayungu, International Market, Abagana and Ichwa. Data were collected using KoboCollect and analysed with frequencies and percentages. The findings show that crop diversification and adjustment of planting dates were the most frequently practised crop-management approaches. Improved or early-maturing crop varieties, cover cropping, mulching and backyard gardening were also reported. However, adoption of agroforestry, irrigation, rainwater harvesting and integrated crop–livestock farming was limited. Most respondents depended on rain-fed agriculture (98.5%), while 62.8% reported no agroforestry practice and 47.6% reported no livestock-management practice. Seasonal weather forecasts (49.1%) and radio/television (30.8%) were the main sources of climate information used to guide farming. The findings indicate that IDPs relied mainly on practices that could be incorporated into existing small-scale farming activities, while practices requiring secure land, finance, equipment and longer-term investment were less common. The study concludes that climate-smart agriculture among IDPs is characterised by uneven adoption, with greater use of crop diversification and planting-date adjustment than capital- and land-intensive practices. Improving secure access to farmland, agricultural inputs, practical training, extension services and climate information would strengthen adoption.

KEYWORDS: Climate-smart agriculture, internally displaced persons, agricultural practices, adoption, Makurdi.

1 INTRODUCTION

Climate change threatens agricultural production through rising temperatures, irregular rainfall, droughts and floods, with consequences for crop yields and the livelihoods of farming households (IPCC, 2022). Climate-Smart Agriculture (CSA) is an approach that seeks to increase agricultural productivity sustainably, strengthen resilience to climate variability and change, and reduce greenhouse-gas emissions where possible (FAO, 2013; Lipper et al., 2014). Its relevance is particularly important for vulnerable households whose livelihoods depend on agriculture. However, the adoption of CSA practices is influenced by access to land, finance, agricultural inputs, information and extension services (Antwi-Agyei et al., 2022; Kehinde et al., 2022).

Evidence from different countries indicates that CSA adoption can contribute to improved livelihoods and food security. Mahashin (2019) reported better livelihood changes among farmers who adopted CSA in Bangladesh, while Hussien et al. (2022) found that adoption improved food security and reduced multidimensional poverty among rural households in Ethiopia. In refugee-hosting communities in Uganda, Turyayesiima (2016) observed that farmers more readily adopted low-cost practices, while practices requiring secure land access and capital, such as agroforestry, were less common. Recent reviews also identify training, access to information, extension services and secure land tenure as important influences on adoption (Mnukwa et al., 2025; Nshakira-Rukundo et al., 2026).

In Nigeria, studies have associated CSA adoption with improved smallholder livelihoods and food-security outcomes, although the practices adopted vary across locations and farming systems (Saadu et al., 2024; Mbanasor et al., 2024; Omotoso & Omotayo, 2025). In Benue State, cassava farmers have been reported to use climate-smart practices, but insecurity and displacement have disrupted agricultural livelihoods and household food security (Nwanguma & Edegbo, 2025; Soomiyol & Fadairo, 2020; Uza et al., 2023). Conditions in IDP camps in the state also include serious humanitarian challenges, including food and water insecurity (Daodu et al., 2024).

Although these studies provide evidence on CSA among farming households, there is limited information on the specific agricultural practices adopted by displaced people in Makurdi Local Government Area. Displacement may restrict access to farmland and resources, influencing which practices IDPs can use. This study therefore examines the climate-smart agricultural practices adopted by IDPs in Makurdi LGA, with particular attention to crop management, crop varieties, soil fertility, water management, agroforestry, livestock management, innovative farming methods and the use of climate information.

2 MATERIALS AND METHODS

Makurdi LGA is located in north-western Benue State, Nigeria, between latitudes 7° 38′-7° 52′N of the equator and longitudes 8° 34′-8° 34′E of the Greenwich meridian, covering approximately 800 km² (Ministry of Lands, Survey and Solid Minerals, Benue State, 2021). It lies within the Benue Plains, underlain by shale and sandstone, with Fadama and tropical ferruginous soils (Abaa, 2004; Nyagba, 1995). Urbanisation, poor drainage and increasing impervious surfaces contribute to flood vulnerability (Iorkua, Aper, & Ayoosu, 2019; Hemba et al., 2017). The area has gentle relief of

about 17–153 m and is drained mainly by the River Benue and its tributaries, including the Uwurudu, where seasonal flooding occurs (Abah, 2013). It experiences a tropical wet-and-dry climate, with annual rainfall of about 1,300 mm, alongside temperatures of 26–31°C and relative humidity of 43–81% (Tyubee, 2004, 2006a, 2006b). Its Guinea Savanna vegetation has been reduced by deforestation and urbanisation, resulting in erosion, soil fertility loss and river siltation (Tyubee, 2004).

Makurdi had a population of 300,077, projected to reach 460,000 by 2020 (National Population Commission, 2006; Tyubee & Anyadike, 2021). The Tiv are dominant, alongside other ethnic groups. Settlement is mainly nucleated, with eleven council wards and dispersed settlements in peripheral areas (Tyubee, 2008). Major occupations include commerce, civil service, farming and fishing, supported by government establishments and higher institutions such as Benue State University and the University of Agriculture, Makurdi (Tyubee, 2008).

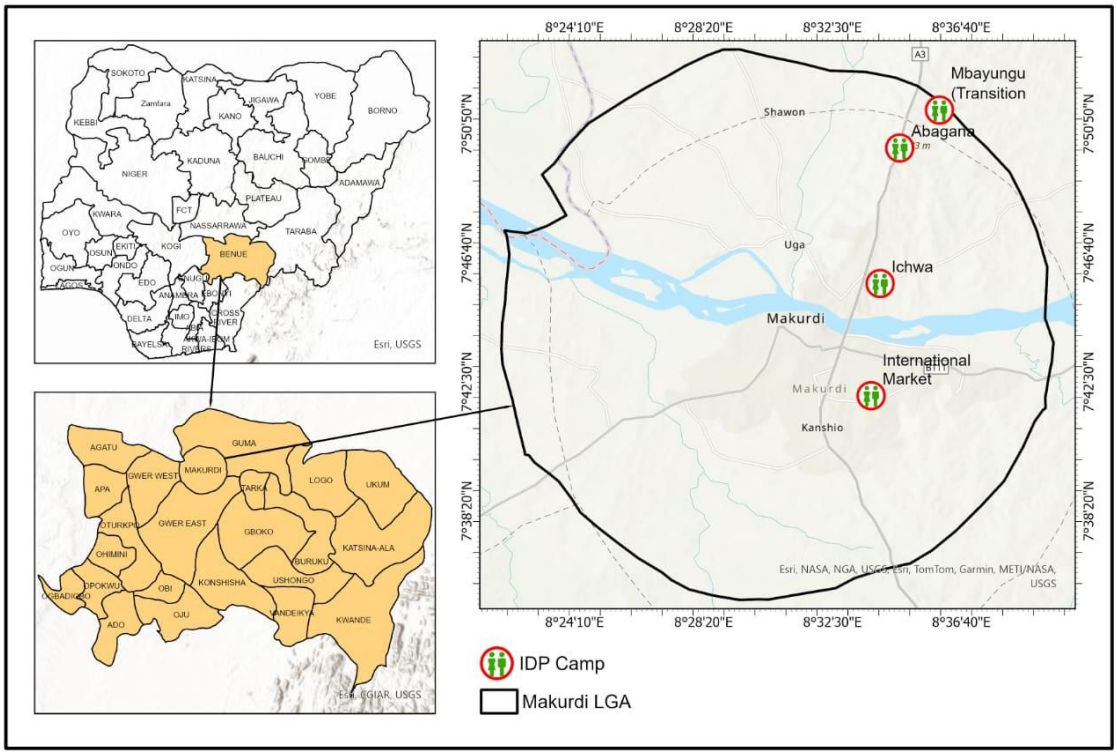


Figure1: Map of Makurdi Local Government Area.

Source: Ministry of Lands, Survey and Solid Minerals, Benue State 2026.

METHODS

The study adopted a survey research design, supported by field observation, to examine climate-smart agricultural practices adopted by internally displaced persons (IDPs) in Makurdi Local Government Area, Benue State. Data were collected on respondents' socio-demographic characteristics, awareness of CSA, sources of information, types and levels of adoption, farming practices, and challenges affecting implementation.

The study population comprised 21,138 IDPs in four camps: Mbayungu (8,560), International Market (6,291), Abagana (4,752) and Ichwa (1,535). A sample size of 393 respondents was determined using the Taro Yamane formula at a 5% margin of error. Proportionate sampling

allocated 159 respondents to Mbayungu, 117 to International Market, 88 to Abagana and 29 to Ichwa. A multistage sampling procedure involving purposive, simple random and systematic sampling techniques was used to select respondents.

Primary data were obtained through structured questionnaires administered face-to-face using KoboCollect, while field observations were used to verify reported agricultural practices. GPS coordinates of the camps and respondents' locations were also recorded. Information was collected on crop diversification, improved crop varieties, planting-date adjustment, soil fertility management, water conservation, agroforestry, livestock management and other innovative farming practices.

Data were coded and analysed using SPSS. Frequencies and percentages were used to describe respondents' characteristics, awareness and adoption levels, types of CSA practices adopted and challenges encountered. Inferential statistics, including Pearson Chi-square, Spearman's rank correlation, binary logistic regression and Cramer's V, were employed to examine relationships among relevant variables. All hypothesis tests were conducted at a 5% level of significance.

3 RESULTS AND DISCUSSION

Climate-Smart Agricultural Methods Adopted by IDPs

This section presents the climate-smart agricultural (CSA) practices reported by internally displaced persons (IDPs) in the study area. The findings cover the frequency of adopting specific practices, crop-management methods, crop varieties, soil-fertility management, water management, agroforestry, innovative farming methods, livestock management and the use of climate information.

Table 1: Use of improved seeds (Drought-resistant crop varieties.

Adoption	Frequency	Percent	Cumulative Percent
Not adopted	59	15.0	15
Rarely	54	13.7	28.7
Sometimes	234	59.5	88.2
Often	21	5.3	93.5
Always	25	6.4	100
Total	**393**	**100**	

Source: Field Survey, 2026.

Table 1 shows that the largest proportion of respondents, 234 (59.5%), sometimes used improved seeds. A further 25 (6.4%) always used them, while 21 (5.3%) used them often. In contrast, 54 (13.7%) used improved seeds rarely, and 59 (15.0%) had not adopted them. Overall, the results indicate that improved seeds were used by many respondents, but regular adoption remained limited. The cost of improved seeds and restricted access to agricultural inputs may help explain this pattern, particularly because 71.8% of respondents identified the cost of improved seeds and tools as a major constraint.

Table 2: Crop diversification (Crop rotation or intercropping).

Practice	Frequency	Percent	Cumulative Percent
Not adopted	48	12.2	12.2
Rarely	13	3.3	15.5
Sometimes	21	5.3	20.9
Often	146	37.2	58
Always	165	42	100
Total	**393**	**100**	

Source: Field Survey, 2026.

Table 2 indicates that crop diversification was widely practised. A total of 165 respondents (42.0%) reported always adopting the practice, while 146 (37.2%) practised it often. Together, these categories account for 79.2% of respondents. Only 48 (12.2%) had not adopted crop di versification, while 13 (3.3%) practised it rarely and 21 (5.3%) sometimes practised it. These findings suggest that crop diversification is an important component of respondents' farming strategies. Growing different crops can spread production risks and support household food av ailability when weather conditions affect particular crops.

Table 3: Agroforestry (planting trees with crops).

Practice	Frequency	Percent	Cumulative Percent
Not adopted	282	71.8	71.8
Rarely	76	19.3	91.1
Sometimes	20	5.1	96.2
Often	4	1	97.2
Always	11	2.8	100
Total	**393**	**100**	

Source: Field Survey, 2026.

The findings in Table 3 show that agroforestry had a low level of adoption. Most respondents, 282 (71.8%), had not adopted the practice, while 76 (19.3%) practised it rarely. Only 20 (5.1%) practised agroforestry sometimes, 4 (1.0%) often and 11 (2.8%) always. This suggests that planting trees alongside crops was not yet a common farming practice among the respondents. Possible barriers include insecure access to land and the time required for trees to provide benefits . These constraints may be particularly important for displaced farmers who face uncertainty about how long they can use their current farmland.

Table 4: Soil conservation (Mulching, use of organic manure like animal dung).

Adoption	Frequency	Percent	Cumulative Percent
Not adopted	72	18.3	18.3
Rarely	54	13.7	32
Sometimes	245	62.3	94.3
Often	17	4.3	98.6
Always	5	1.3	100
Total	**393**	**100.0**	

Source: Field Survey, 2026.

Table 4 shows that 245 respondents (62.3%) sometimes used soil-conservation practices, making this the most common response. Meanwhile, 72 (18.3%) had not adopted these practices, and 54 (13.7%) used them rarely. Only 17 (4.3%) practised them often, while 5 (1.3%) always did so. The results suggest that soil-conservation methods were known or used by some respondents but were not regularly applied by most. Promoting practical, affordable methods such as mulching and organic manure could help improve soil management, although access to materials and suitable farmland may influence adoption.

Table 5: Early or late planting (adjusting planting dates).

	Frequency	Percent	Cumulative Percent
Not adopted	46	11.7	11.7
Rarely	8	2	13.7
Sometimes	18	4.6	18.3
Often	76	19.3	37.7
Always	245	62.3	100
Total	**393**	**100**	

Source: Field Survey, 2026.

Table 5 indicates that adjustment of planting dates was one of the most frequently adopted pra ctices. A total of 245 respondents (62.3%) reported always adjusting their planting dates, while 76 (19.3%) did so often. In contrast, 46 (11.7%) had not adopted the practice, 8 (2.0%) used it rarely and 18 (4.6%) sometimes adjusted planting dates. The high level of frequent adoption is consistent with the finding that 96.2% of respondents had observed irregular rainfall in the preceding two years. Adjusting planting dates may therefore be a practical response to changing rainfall patterns and uncertainty about the onset of the farming season.

Table 6: Integrated crop–livestock farming (Combining crop farming with livestock production so crop residues can feed animals and manure can fertilize crops).

	Frequency	Percent	Cumulative Percent
Not adopted	132	33.6	33.6
Rarely	169	43	76.6
Sometimes	83	21.1	97.7
Often	5	1.3	99
Always	4	1	100
Total	**393**	**100**	

Source: Field Survey, 2026.

Table 6 shows that integrated crop–livestock farming was not widely practised regularly. The largest group, 169 respondents (43.0%), reported practising it rarely, while 132 (33.6%) had not adopted it. A further 83 (21.1%) practised it sometimes. Only 5 (1.3%) reported frequent adoption and 4 (1.0%) reported always practising it. These results indicate that the integration of crop and livestock production was less established than practices such as crop diversification and planting-date adjustment. Limited livestock ownership, financial constraints and the difficulty of maintaining livestock while displaced may help explain the low frequency of adoption.



Plate 1: Integrated livestock farming at Mbayungu IDP Camp

Source: Field Survey, 2026.



Plate 2: Crop Diversification: Pepper, maize, melon.



Plate 3: Crop Diversification: melon, sweet potato, beans, and vegetables.



Plate 4: IDP Rice Farm at IDP Integrated Crop Farm Tyo-Mu.

Table 7: Type of crop management practices.

	Frequency	Percent	Cumulative Percent
Use of improved sees	99	25.2	25.2
Crop diversification	145	36.9	62.1
Crop rotation	18	4.6	66.7
Intercropping	20	5.1	71.8
Early or late planting	107	27.2	99
No specific practice	4	1	100
Total	**393**	**100**	

Source: Field Survey, 2026.

As shown in Table 7, crop diversification was the most commonly identified crop-management practice, reported by 145 respondents (36.9%). Early or late planting followed, with 107 respondents (27.2%), while 99 (25.2%) identified the use of improved seeds. Intercropping accounted for 20 respondents (5.1%), and crop rotation for 18 (4.6%). Only 4 respondents (1.0%) reported using no specific crop-management practice. These findings reinforce the results in Tables 9 and 12, which show that crop diversification and planting-date adjustment were prominent practices. The results also indicate that respondents relied more on selected crop-management approaches than on a broad range of practices.

Table 8: Type of crop varieties do you cultivate.

	Frequency	Percent	Cumulative Percent
Improved/early-maturing varieties	191	48.6	48.6
Drought-resistant varieties	2	0.5	49.1
Pest- and disease-resistant varieties	1	0.3	49.4
Local/traditional varieties only	18	4.6	53.9
Combination of improved and local varieties	180	45.8	99.7
Foreign variety	1	0.3	100
Total	**393**	**100**	

Source: Field Survey, 2026.

Table 8 shows that 191 respondents (48.6%) cultivated improved or early-maturing varieties, while 180 (45.8%) combined improved and local varieties. Only 18 (4.6%) relied exclusively on local or tr aditional varieties. The results indicate that improved varieties formed part of the crop selection strategies of many respondents, either alone or alongside local varieties. Early-maturing varieties may be useful where the timing and duration of rainfall are uncertain. However, only two respondents (0.5%) specifically reported drought-resistant varieties, indicating that the use of this particular category was very limited in the sample.



Plate 6: Plate 5: Soybeans Farm at IDP Camp Mbayungu.

***Source*:** Field Survey, 2026.



Plate 6: Yam and Maize Farm at IDP Camp Mbayungu.

***Source*:** Field Survey, 2026.



Plate 7: Cassava Farm at IDP Camp Mbayungu.

***Source*:** Field Survey, 2026.

Table 9: Adopted soil fertility management practices.

	Frequency	Percent	Cumulative Percent
Mulching	111	28.2	28.2
Use of organic manure	56	14.2	42.5
Composting	2	0.5	43
Cover cropping	177	45	88
No soil management practice	10	2.5	90.6
Conservation tillage(minimum/zero tillage)	32	8.1	98.7
Use of fertilizer	5	1.3	100
Total	**393**	**100**	

Source: Field Survey, 2026.

Table 9 shows that cover cropping was the most commonly reported soil-fertility management practice, adopted by 177 respondents (45.0%). Mulching was reported by 111 respondents (28.2%), while 56 (14.2%) used organic manure. Conservation tillage was reported by 32 respondents (8.1%). In comparison, 10 (2.5%) reported no soil-management practice, while com posting and fertilizer use were reported by 2 (0.5%) and 5 (1.3%) respondents, respectively. The findings suggest that respondents used a range of soil-management methods, but the pattern was concentrated in cover cropping and mulching. The low reported use of composting and fertilizer may reflect differences in access to inputs, resources or knowledge, although the survey.

Table 10: Type of water management practices do you used.

	Frequency	Percent	Cumulative Percent
Rain-fed agriculture only	387	98.5	98.5
Rainwater harvesting	2	0.5	99
Drip irrigation	2	0.5	99.5
Small-scale irrigation (wells, pumps)	2	0.5	100
Total	393	100	

Source: Field Survey, 2026.

Table 10 indicates that respondents depended overwhelmingly on rain-fed agriculture. A total of 387 (98.5%) relied exclusively on rainfall, while only 2 respondents each (0.5%) reported rainwater harvesting, drip irrigation or small-scale irrigation. This dependence on rainfall is important in view of the high proportion of respondents who reported irregular rainfall. It suggests that most respondents had few alternative water-management options recorded in the survey, potentially leaving their farming activities vulnerable to changes in rainfall timing and distribution.



Plate 8: Reservoirs for Dry Season Irrigation at IDP Integrated Farm Tyo-Mu.

***Source*:** Field Survey, 2026.

Table 11: Practice of agroforestry.

	Frequency	Percent	Cumulative Percent
Yes, planting trees with crops	68	17.3	17.3
Yes, trees for shade and windbreak	7	1.8	19.1
Yes, fruit trees integrated with farming	56	14.2	33.3
No agroforestry practice	247	62.8	96.2
Not aware of agroforestry	15	3.8	100
Total	**393**	**100**	

Source: Field Survey, 2026.

Table 11 shows that 247 respondents (62.8%) reported no agroforestry practice, while 15 (3.8%) indicated that they were not aware of agroforestry. Among the practices reported, planting trees with crops was identified by 68 respondents (17.3%), and integrating fruit trees with farming was reported by 56 (14.2%). Only 7 (1.8%) reported planting trees for shade or windbreaks. These results support the earlier finding in Table 10 that agroforestry adoption was limited. The relatively low adoption of tree-based practices may be particularly relevant where farmers face uncertainty about continued access to land.

Table 12: Innovative farming methods practiced.

	Frequency	Percent	Cumulative Percent
Backyard gardening	387	98.5	98.5
Sack farming	3	0.8	99.2
Vertical gardening	3	0.8	100
Total	**393**	**100**	

Source: Field Survey, 2026.

Table 12 shows that backyard gardening was overwhelmingly the most commonly reported innovative farming method, with 387 respondents (98.5%) identifying it. Sack farming and vertical gardening were each reported by 3 respondents (0.8%). This pattern indicates that backyard gardening was far more common than the other two methods in the sample. Its prevalence may reflect the practical value of small-scale food production close to respondents' residences, although the survey does not directly establish why respondents selected this method.

Table 13: Type of livestock management practices adopted.

	Frequency	Percent	Cumulative Percent
Improved animal breeds (Poultry keeping, Goat/sheep rearing, pigs)	178	45.3	45.3
Rotational grazing	2	0.5	45.8
Fodder conservation	1	0.3	46.1
Integrated crop–livestock farming	4	1	47.1
Improved animal housing	21	5.3	52.4
No livestock practice	187	47.6	100
Total	**393**	**100**	

Source: Field Survey, 2026.

Table 13 indicates that 187 respondents (47.6%) reported no livestock-management practice. Meanwhile, 178 (45.3%) identified improved animal breeds, and 21 (5.3%) reported improved animal housing. Rotational grazing, fodder conservation and integrated crop–livestock farming were each reported by fewer than 2% of respondents. These findings suggest that livestock-related CSA practices were limited, particularly those involving grazing management, fodder conservation and integration of crop and livestock production. This pattern is consistent with the low adoption of integrated crop–livestock farming reported in Table 13.

Table 14: Use of any climate information to guide your farming activities.

	Frequency	Percent	Cumulative Percent
Seasonal weather forecasts	193	49.1	49.1
Information from radio/TV	121	30.8	79.9
Information from NGOs	29	7.4	87.3
Do not use any information	50	12.7	100
Total	**393**	**100**	

Source: Field Survey, 2026.

Table 14 shows that seasonal weather forecasts were the most frequently reported source of climate information, used by 193 respondents (49.1%). Another 121 (30.8%) relied on radio or television, while 29 (7.4 %) received information from non-governmental organisations. However, 50 respondents (12.7%) reported that they did not use any climate information to guide their farming activities. The findings indicate that weather forecasts and broadcast media were the main reported information sources. Given the high incidence of irregular rainfall in the study area, access to timely and understandable climate information may help farmers make decisions about planting dates and other farming activities. Nevertheless, the proportion not using climate information in dicates a gap that agricultural extension services and other information providers could address.

4 CONCLUSION

The study concludes that climate-smart agricultural practices adopted by IDPs in Makurdi LGA are uneven in type and frequency. Crop diversification and adjustment of planting dates were the most prominent practices, while improved or early-maturing varieties, cover cropping, mulching and backyard gardening were also reported. In contrast, agroforestry, irrigation, rainwater harvesting and integrated crop–livestock farming were poorly adopted. The overwhelming dependence on rain-fed agriculture indicates limited access to alternative water-management options. The pattern suggests that respondents relied more on practices that could be integrated into existing small-scale farming activities, while practices requiring secure land access, finance, equipment or longer-term investment were less common. Access to secure farmland, agricultural inputs, extension services, practical training and timely climate information is therefore important for strengthening the adoption of a wider range of CSA practices among displaced farming households.

RECOMMENDATIONS

1. Government, humanitarian organisations and host communities should establish secure and predictable land-access arrangements for IDPs. Secure access would encourage farmers to invest in longer-term practices such as agroforestry and soil improvement.
2. Government agencies, NGOs and development partners should improve IDPs' access to affordable improved seeds, farm tools and other appropriate agricultural inputs through grants, input vouchers and accessible credit schemes.

3. Practical extension training should be provided on crop diversification, improved and early-maturing varieties, planting-date adjustment, cover cropping, mulching, agroforestry, water management and integrated crop–livestock farming.
4. Timely and understandable seasonal climate forecasts should be disseminated through radio, community-based information services, farmer groups and extension workers to support decisions on planting dates and crop selection.
5. Demonstration farms and farmer-to-farmer learning activities should be encouraged so that IDPs can observe and practise locally appropriate CSA methods.
6. CSA programmes should prioritise affordable practices that use locally available resources, while community-based irrigation and other shared facilities should be considered where individual ownership is unaffordable.

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