

Impact of floods on socio-economic livelihoods: A cross-sectional case study of Aweil South County, South Sudan.

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Page | 1

Abstract.

Background

A flood is typically an overflow of water that submerges land, low-lying cities, and villages, or an exceptional circumstance caused by the current inflow. This study examined the impact of floods on socio-economic livelihoods, a case of Aweil South County, Northern Bahr el-Ghazal state.

Methodology.

The study adopted a cross-sectional case study design, where both quantitative and qualitative approaches were employed for data collection. The study had discussions with key Stakeholders at payams and Community levels, as well as randomly sampled households. Both qualitative key informant interviews and quantitative household questionnaires were utilized to get the information.

Results.

Findings revealed that 54.95% of households were male-headed, with most male heads aged 36–59 and female heads aged 18–35. Agriculture was the primary livelihood (33%), followed by livestock production (30%) and trading (14%). Floods severely affected households: 96.87% reported crop damage, 97.65% lost food stocks, 92.43% experienced livestock loss, and 93.75% reported snake bites. Health impacts included disease outbreaks, with 97.92% of households reporting illness, and 96.61% experienced disruption in health service access due to damaged infrastructure. Educational facilities and houses were heavily damaged, forcing 95.57% of households to relocate temporarily. Coping strategies included shifting to higher ground, migration, and resource sharing; 54.43% of households considered these strategies partially effective.

Conclusion:

Floods in Aweil South significantly compromise household livelihoods, food security, health, and infrastructure, with communities demonstrating limited adaptive capacity due to dependency on crop and livestock production and poor access to alternative resources.

Recommendations:

Communities should be urged to construct homes made of sturdy materials far from high-risk areas. In order to improve household food security, the Ministry of Agriculture should also urge communities to expand the area under cultivation on higher ground through the Extension Services.

Keywords: Floods, Socio-Economic Livelihoods, Aweil South County, South Sudan.

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Background.

A flood is typically an overflow of water that submerges land, low-lying cities, and villages, or an exceptional circumstance caused by the current inflow. Flooding can happen when water overflows from bodies of water, such as rivers, lakes, the sea, or vast natural water basins, or it can happen when rainwater builds up on wet ground and causes an airborne flood. Flooding that results from catastrophic hydro- and meteorological phenomena and occurs at unexpected frequencies and magnitudes can, in certain cases, result

in the loss of lives, livelihoods, and infrastructure. Floods have been identified as one of nature's most damaging hazards, wreaking havoc on human communities and the built environment as a whole. Economic damages brought on by destructive floods have greatly increased globally (IPCC 2017). Flooding ranks high in the list of the most catastrophic natural disasters globally (Saleh, Ur Rahman, 2014). It occurs in various forms: coastal flooding, river flooding, or flash flooding (Thi et al., 2020). Flooding occurs due to mixed factors, both natural and human-induced.

Natural factors like heavy rainfall, long periods of rain, snowmelt, steep slopes, impermeable rock (doesn't allow water through), very wet, saturated soils, and compacted or dry soil. Human-induced factors like constructing buildings, surrounding roads, and paths create impermeable surfaces, which increase surface run-off. Additionally, drains enhance the water flow into nearby rivers, raising the possibility of flooding. Flooding is one of the most life-threatening natural disasters that the world has to contend with. Studies reveal that the losses attributed to flooding are unmatched among the natural disasters suffered in the world (Saleh et al., 2014). Different countries are exposed to floods of varying magnitudes. Because of this, they use novel approaches to try to address the issues based on the availability of resources and the extent of the calamity.

The developed countries use advanced methods of combating floods, while the developing countries remain largely vulnerable to the dire effects of flooding. This is due to the huge number of people living in flood-prone areas, coupled with the limited resources.

Floods result in the spread of diseases, destruction of infrastructure, loss of property, and loss of lives. Perera et al (2022) give an account of the health impacts of floods, citing a number of issues, including disease outbreaks, mental disorders, and their associated costs to the country. They affirm that over 50% of all waterborne diseases in America are caused by floods, which transform most waterways into contaminated water as they carry disease-causing organisms.

Not only can floods cause enormous losses in Australia, but they also cause damage worldwide. Their impact is felt hardest in the events where they cause mass fatalities. Other than death, however, floods can cause huge economic losses through the destruction of properties, health care costs that result from the provision of health care services to the victims, as well as the destruction of public utilities like causeways and roads.

South Sudan, like any other developing country, suffered the devastating impact of floods. Some 1,338,620 individuals have been displaced due to conflict and flooding in the country during the past four years (IOM 2022). Devastating floods in Aweil South County alone in 2021 forced more than 4,500 residents to temporarily relocate across the Payams of the County (IOM 2022). According to a report on flood damage issued by the Northern Bahr El Ghazal State government on September 14, 2022, hundreds of homes collapsed, 30 snake bite deaths were reported, 35 people perished, and thousands of acres of agriculture were swamped. According to RRC 2022, 77 percent of the population was impacted; many people had to leave their houses and move to higher ground. The floods in Aweil South County have severely damaged most of the infrastructure, and the area's functional medical facilities are already scarce and underfunded. Flooding

has also made it more difficult for people to access healthcare, as many people now reside more than 10 kilometers from a hospital. The population is at a significant risk of contracting diseases like malaria because they lack access to healthcare, clean water and sanitation, appropriate food, shelter, and jobs. Children under five, women who are pregnant or nursing, older persons, and people with impairments, especially those with mental health concerns, are those who are most at risk. Over time, there has been an increase in the frequency of natural catastrophes, which cause death, property damage, and environmental harm. Those in danger have been increasing in number (Nnodim et al., 2020)

People have become more exposed because they live in risky areas like flood plains and areas prone to flooding as a result of high poverty levels and conflicts in the majority of the country.

They are more vulnerable to disasters since they have fewer resources. They are less likely to get alerts in time. They also have fewer choices for quickly lowering losses, even if warnings were given. The ability to withstand disasters and the recovery process are both impacted by poverty levels. Socioeconomic considerations must be addressed in disaster mitigation, preparedness, and preventive efforts in addition to geological and climatic factors (Zhou et al., 2020). In localities in Northern Bahr-El Gazal State devastated by flooding from August 29 to August 31, 2022, 7,541 households and 27,804 animals were counted (IRNA 2022).

People have adapted for generations to the regular occurrence of floods in many different parts of the world, which occur with diverse magnitudes and frequencies. In many places of the world, these floods are both expected and desired since they improve the soil, supply water, and create livelihoods. This study aims to assess the impact of floods on the socio-economic livelihoods of the people of Aweil South, Northern Bahr El Ghazal State.

Methodology.

Research Design

An analytical and descriptive design under a cross-sectional study was used among the systematically randomly selected households in the study area. This research design was used to provide valuable information about the levels of a particular attribute of interest in Aweil South County.

Study Area.

The western flood plains sorghum and cattle livelihood zone includes Aweil South County, which is located at coordinates 8.706345° 27.7569667° (+/-) 3.900 m Altitude and contains grassland, swampy areas with papyrus reed, and pockets of forest. More than 7,806 people call this region home, and more than 75 percent

of the land is planted in crops, primarily maize, sorghum, millet, groundnuts, and vegetables. Fishing and raising livestock are both activities. According to FEWSNET (2018), Aweil South County is located in the western flood plains sorghum and cattle livelihood zone. Agriculture and livestock raising are the main economic activities in the studied area. Seasonal employment, services, and businesses are other sources of livelihood. The majority of people in this region rely on seasonal agriculture and animal husbandry. The area's principal exports include vegetables, maize, sorghum, millet, and groundnuts. Floods have affected the local population in this area over the last four years.

Variables.

Dependent Variable.

Dependent variables in this study are the different socio-economic livelihood assets that are affected, like Agriculture, the Health sector, and infrastructure, which impact the socio-economic livelihoods of the people.

Independent Variables.

The independent variable in this study is the flood that affects the socio-economic livelihood assets of Agriculture, the health sector, and infrastructure.

Target Population

The Target population consisted of household heads or their representatives and key informants from the study area of Aweil South County. The Location had a total population of 73,806 people and 14,299 households based on the 2021 South Sudan population estimation survey. The study targeted 384 households in all Nine Payams of Aweil South County. These Payams include Nyocawany I, Ayai, Gakrol, Nyieth, Nyocawany II, Panthou, Tar-Weng, Tiar-Aleit, and Wathmuok.

Sampling Size and Techniques.

Sample Size

Slovin's formula was used to determine the sample size for the participants who were selected to participate in the questionnaire.

$$n = N / (1 + Ne^2)$$

Where N is the population size and n is the sample size.

$$n = \frac{10,000}{1 + 10,000 * 0.05^2}$$

$$= 384$$

A total of **384** household questionnaires were collected during the study.

Sampling Techniques.

Aweil South County is purposively selected based on Flood background information available, which ranked the entire Northern Bahr El Gazal state as one of the worst flood-affected states in the Country. Purposive sampling focuses on choosing participants who have qualities related to the research topic in order to collect

qualitative replies, which yields deeper insights and more accurate research findings. Considering the consecutive floods that have been observed in the County over the past four years, from 2019 to 2022. The sampling frame is Aweil South County, and the sampling units are households. Using information from the South Sudan Population Estimation Survey 2021, a systematic random sampling of 384 households from among the 14,299 households in the study location is carried out.

Inclusion Criteria.

The study targeted adult household heads or their spouses within the designated area. A pre-defined skipping pattern was used to select households for inclusion in the sample. This pattern was established by dividing the total number of households, based on the 5th Sudan Population and Household Census of 2008, by the sample size required for this study. Consequently, for every 37 households, one was selected for inclusion until the desired sample size was achieved.

Exclusion criteria.

The study will exclude certain households from participation. Specifically, returnee households that settled in the area less than three months before the study's conduct will be excluded. Additionally, children under the age of 18 and visitors will not be considered as household representatives. Households that do not have respondents who meet the inclusion criteria or are absent will be skipped, and alternative households will be sampled for inclusion following a similar pattern.

Data Sources and Data Collection.

Questionnaire.

A structured household questionnaire was designed to collect quantitative data relevant to the objectives of the study from a total of 384 study respondents. The questions in the research instruments will be divided into various sections in line with the study objectives to provide information relevant to the study. All research instruments were translated into Dinka and then back-translated into English to ensure precision in the wording of the questions. The research instruments were subsequently revised to eliminate problems in translation and language comprehension. All questions were asked in the Dinka language, as this is the native language used by the respondents; part of the household questionnaire requires the principal investigator to ask questions on various topics to a respondent (pre-coded and un-coded responses will be expected), and other questions required the principal investigator to make key observations as indicated in the observation checklist.

Observation Checklist

Observations, as a method of collecting research data, were used during the study and involved observing damages caused by floods and systematically recording the results of those observations using an observation checklist, which was included in the household questionnaire. The key observations in the study were guided by the research questions. Household that were visited during the study was observed to determine whether the households had damage caused by floods. All observations were immediately recorded in the observation checklist to avoid errors/bias.

Transect Walks.

To complement the other data collection tools, a systematic walk along a defined path across the study area, together with the local people, was conducted to explore the impacts of the flood by observing, asking, listening, and looking. A common path to cover the full study area was used. All participants were sensitized on the key parameters that were observed and recorded. They include the impacts of floods on Farmland, livestock, and infrastructure.

Focus Group Discussion and Key Informant Interview.

A Key Informant Interview (KII) and Focus Group Discussion (FGD) guide was designed to collect qualitative data. This guide contains a list of questions to guide and narrow the discussions to the relevant issues around the research questions. One FGD consisting of twelve people that includes women leaders, local chiefs, youth leaders, opinion leaders, and community intellectuals was used in each Payam. Payam leaders, including RRC representatives from each payam, religious leaders, and chiefs, form the key informants (KI). During the FGDs and KIIs, the principal investigator was assisted by one data collector to help in language translation and take notes based on responses from all participants to enable comparison and ensure adequacy of information captured during the interviews. The FGDs and KIIs were supplemented by quantitative data collected from the households as well, and background information was obtained to determine whether or not the situation in the surveyed areas reflected the general situation within the entire community.

Data Analysis and Interpretation.

Data Analysis.

In unprocessed form, field data can be challenging to understand. Thus, upon data collection, the questionnaire is sorted out to find whether all had been responded to. Questions were coded. Statistical Packages for Social Science (SPSS) was used to

analyze quantitative data using frequencies and percentages in a descriptive and inferential manner, while qualitative data was analyzed thematically in accordance with the study objectives and was presented in a narrative format. The link between the study's independent and dependent variables was determined using bivariate analysis. The data involved in this study were reduced to numerical values, tables, graphs, and charts.

Validity.

Validity considerations were made to ensure that the research truly measures what was intended to measure. Content validity is enhanced by consulting Subject Matter Experts/thesis supervisor (SMEs) who review the content of the research collection instruments in line with the study objectives. Internal validity is strengthened by limiting the study to residents of Aweil South County.

Reliability

To ensure that the research instruments used for data collection allow for repeatability of results or observations, all questions were consistently asked in the local language (Dinka). Definition of operational terms, thorough training of Data collectors, daily field meetings with the research data collectors, and close observation were undertaken by the principal investigator to further safeguard the reliability of the data collected. Completed questionnaires were re-checked for completeness, and errors were corrected immediately.

Ethical Considerations.

The study focused on the impacts of floods on the socio-economic livelihoods of people. Participation in the study was voluntary, informed consent and an introduction letter from the college were obtained before data collection, and personally identifiable information such as participants' names was not collected, and maximum confidentiality of information gathered was assured to all participants throughout the study process.

Results

Household Demographics

The demographic distributions are such that out of the three hundred eighty-four (384) households sampled in the survey, 54.95% were male-headed and the remaining 45.05% female-headed, with a variation of 9.9%. In terms of the ages of the heads of households, the survey findings show that most of the male respondents fall within the 36-59 years of age, whereas among the females, most of them fall within the age group 18-35 years of age.

Table 1: The composition of the age group of the study area.

Sex	Age groups				Total
	Below 18	18-35	36-59	60 and above	
Female	50.00%	52.17%	39.81%	51.06%	45.05%
Male	50.00%	47.83%	60.19%	48.94%	54.95%
Total	100.00%	100.00%	100.00%	100.00%	100.00%

Source: Researcher 2024

In terms of occupation of people within the research area, Agriculture, business, Formal employment, informal employment, and livestock keeping are mainly practiced by

male respondents; the women practice least of these compared to the males, with a 54.95% versus 45.05% ratio as in Table 2.

Table 2: The occupation of the respondents of the study area.

Sex	Occupation					Total
	Agriculture	Business	Formal employment	Informal employment	Livestock keeping	
Female	46.18%	35.29%	42.55%	41.67%	42.86%	45.05%
Male	53.82%	64.71%	57.45%	58.33%	57.14%	54.95%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Source: Researcher 2024.

The findings revealed very high illiteracy levels among the male and female respondents. There is no formal education, as 82.03% have not attained any level of formal education, with only 17.97% of the respondents with formal education

at either a primary, secondary, or tertiary level of education. This indicates that the target area is a typical Rural village with less focus on education, as indicated in Table 3.

Table 3: The educational level of respondents.

The highest level of education of the household head	Sex		
	Female	Male	Total
No formal education	84.39%	80.09%	82.03%
Primary	6.94%	7.58%	7.29%
Secondary	7.51%	8.53%	8.07%
Tertiary/University	1.16%	3.79%	2.60%
Total	100.00%	100.00%	100.00%

Source: Researcher 2024.

Major Livelihood Strategy

The research revealed that the first most important livelihood sources for the assessed communities in Aweil South were crop production (33%), followed by livestock production (30%) and trading (14%).

Discussions with KIIs and in FGD established that the main source of income for most households was crop production, followed by livestock production and trading. The main sources of food were found to be own production, followed by casual labor and trading. The implication is that since crop production is the main source of livelihood and food, increased exposure to floods will exacerbate their vulnerabilities by compromising their household food security. There is clear evidence that the communities in Aweil South had very limited livelihood options, as most of them indicated having little or no significant secondary

livelihood sources. The implications are such that the communities will have reduced resilience to floods due to a lack of a wide range of livelihood options. Of all the assessed households, only 30%, 14% and 10% indicated that livestock production, Trading, and fishing, respectively, were the second sources of livelihoods.

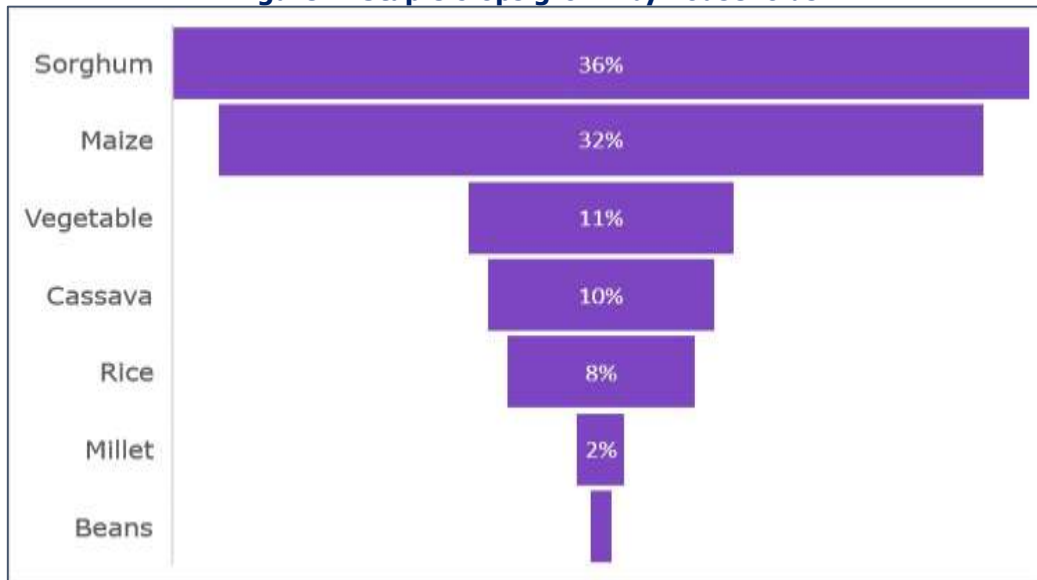
Livestock Kept

Most of the sampled households kept Cattle, Goats (37% and 35% respectively), followed by pigs and sheep on a low scale. This indicates that the sampled population practiced subsistence farming as a second option to animal keeping/pastoralism. Similar data were obtained from the FGDs and KII rating cattle and goats as the most preferred livestock kept by most of the households, as in the Main Staple Crops Grown by Households.

Among the sampled population, the majority of the respondents revealed sorghum and maize as their staple food crops, supplemented with the growing of vegetables. Similar findings were obtained from the FGDs, stating that these

cereals were to support the livestock products, especially milk, for household consumption, as the population depends entirely on two key livelihood options, that is, crop and livestock production.

Figure 1: Staple crops grown by households.



Source: Researcher 2024

Effects of the Flood on Households.

Most of the sampled households (96.87%) indicated that their crops were damaged by floods. It was also evident that the crops that were damaged by floods were the main staple crops (sorghum and maize) it was evident There was an impact on agriculture, which is the main source of livelihood and income, as discussed under the livelihood patterns. The Implications are that there will be reduced staple crop production, which will result in reduced food availability.

This finding has provided a better understanding of the vulnerability of the households due to their over-dependency on crop production as their main livelihood source. Out of the 384 sampled households, 97.65% and 96.87% indicated having experienced food stock losses and crop damage due to floods, respectively. 93.75% of the respondents reported cases of snake bites during the time of floods; a similar revelation was made during KII with the payam leaders, including the death of livestock due to the rising floodwater levels within the area.

Table 4: Socioeconomic impact of floods on households.

Statements	Yes*(%)	No*(%)	Total
Death/Loss of livestock due to floods	92.43%	7.57%	100%
Crop damage during the flood	96.87%	3.13%	100%
Loss of food stock in your stores during floods	97.65%	2.35%	100%
Floodwater is affecting your farmland	95.05%	4.95%	100%
Cases of snake bites in your community during the floods	93.75%	6.25%	100%

Source: Researcher 2024

Effects of the Flood on the Health Sector

The research revealed that most of the sampled households (89.32%) indicated that health facilities were available in their communities. Furthermore, most households (95.83%) indicated that health facilities had been damaged by flooding in their communities. The study further revealed that

96.61% of the sampled households experienced disruption in access to health services due to damaged roads and bridges as a result of floods.

Disruption in accessing health services implied an increase in disease incidence due to a lack of access to appropriate medication.

The research also revealed that out of the 384 sampled

households, 97.92% indicated having at least one member of their household getting sick during the floods. The most significant diseases experienced among the sampled households were diarrhea 33% skin disease 18%, malaria 16%, Typhoid, 16% measles 15% and cholera, 3%.

The KII and FGD further revealed that open source (surface water from streams) and boreholes are their main source of water for households; thus, during the floods, all their water

points were contaminated by the flood waters, and households started experiencing diseases upon using these water points. This means that households will continue to be vulnerable to increased disease outbreaks as long as the river continues to be among their main source of drinking water. This is a result of increased contamination that occurs during flooding.

Table 5: socioeconomic impact of floods on the health sector.

Statements	Yes*(%)	No*(%)	Total
A functional health facility in your area before the floods	89.32%	10.68%	100%
Damage to the health facilities during floods	95.83%	4.17%	100%
Disruption in access to health services during the floods	96.61%	3.39%	100%
A household member got sick during the flood	97.92%	2.08%	100%

Source: Researcher 2024

Effects of Flood on Infrastructure

All the sampled households indicated the availability of education facilities in their communities. Furthermore, 95.57% of the sampled households indicated that school infrastructure was damaged due to floods in one way or another. During the FG discussions and interviews with KIs, they indicated that school-going children experienced disruption due to floods. The disruption was attributed to various reasons, such as the road being impassable and the school being submerged.

Among the sampled households, 92.97% indicated that their houses collapsed due to the excessive impacts of floods, while the rest had their houses intact.

About 95.57% of the households whose houses were impacted by floods were forced to relocate to other alternative areas, while the remainder continued to stay within their home states. The community discussions revealed that some displaced households sent their children to stay with other relatives. This, in a way, disrupted their

pattern of life and social networks. For those who have moved temporarily to higher grounds, have returned to their usual residence. Discussions with these households indicated a positive will to move permanently to safer havens should alternative fertile land be secured by relevant authorities. It is worth mentioning that some households have shifted to a new area altogether.

The study revealed that 97.14% of health facilities had been damaged by floods in their communities. During discussions with groups and KIs, they indicated the presence of damage to health facilities, rooms, and sanitation facilities, and health facilities being submerged in flood waters. The study further revealed that 76.82% of the sampled households experienced disruption in access to health services due to damaged roads and bridges as a result of floods. This destruction, therefore, means that the community will not have access to health services, and once they are sick, they will not be able to be more productive to sustain their livelihood options. A sick population will always be vulnerable to meeting their socioeconomic livelihoods.

Table 6: The impact of floods on infrastructure.

Statements	Yes*(%)	No*(%)	Total
Road access for your household to access social services affected by floods(breakdown)	76.82%	23.18%	100%
Damage to the school infrastructure (classroom blocks, offices, toilets) due to the floods	95.57%	4.43%	100%
Houses collapsed or were damaged due to the floods	92.97%	7.03%	100%
The collapse of the house forced you to relocate to a new area	95.57%	4.43%	100%
Flood caused damage or destruction to the health care infrastructure	97.14%	2.86%	100%

Source: Researcher 2024

Coping Strategies

The survey established that sampled households employed a range of coping strategies due to the floods. The highly

ranked important coping strategies were shifting to higher ground, migrating to safer places, and sharing resources in the community.

The research showed that households had other diverse coping options, though not effective. Of the sampled households, 54.43% indicate that the highly ranked coping strategies were partially effective. The survey established that households whose coping

strategies were shifting to higher grounds and migrating to other places had trading and fishing as their main livelihood during the time of floods, as other livelihood options were not possible.

Table 7: Main coping strategies that you employed during floods

Main coping strategies that you employed during floods	Freq(N)	%	Rank
Shifting to a higher ground	374	25%	1 st
Migrate to safer places	297	20%	2 nd
Sharing resources in the community	292	20%	3 rd
Community group house repairing	272	18%	4 th
Selling of properties to generate income	223	15%	5 th
Assistance from NGOs or Charities	24	2%	6 th
Assistance from the government	15	1%	7 th

Note that the frequency (N) was from the multiple response questions, which is why it appeared more than the actual sample size of 384.

Table 8: Effectiveness of household copying strategies.

	Are the above coping strategies effective?
Not effective	31.51%
Partially effective	54.43%
Very effective	14.06%
Total	100.00%

Source: Researcher 2024

Discussion of results

From the results of the analysis, it is clear that the floods, particularly from the 2021/2022 rainfall season, impacted the livelihoods and critical aspects, namely Housing, property & assets, Agriculture, Health, and infrastructure, like the road network, of the people in Aweil South County, this result is similar to findings from the IRNA conducted in August 2022 in Northern Bhar- El gazal state. The main livelihood of the sampled households was crop production, followed by livestock production. The survey established that over 96.87% of households had their crops damaged, mainly sorghum and maize, which are the staple crops, and this ultimately resulted in food insecurity at the household level. As discussed under the livelihood strategies, crop production was the main livelihood and income source. This, in a way, reduced people's income since income sources are embedded in livelihoods. Further, for those households that had some food stocks at the time of the floods, these were damaged and consequently compromised food security at the household level. This finding is in line with a similar report on IRNA conducted by the Northern Bahr-El Gazal State Inter-agency multi-sector assessment in August 2022.

As health facilities/infrastructures were affected by the floods, access to health services was hampered due to damaged and/or washed-away roads, bridges, and culverts. This ultimately contributed to increased disease burden (mainly diarrhea, skin diseases, and malaria) at the household level. The disease incidences were also attributed to access to unsafe water sources and flooded sanitation facilities.

Water and sanitation infrastructures like boreholes were submerged in flood waters, open water sources were the main source of water, followed by boreholes for most of the sampled households. This means that households will continue to be vulnerable to increased disease outbreaks as long as the area remains flooded. This is a result of increased contamination that occurs in their available drinking water sources during flooding. This finding is similar to the IRNA 2022 findings conducted in Aweil South, and findings by Nnodim, A. U., and Ezekiel C (2020) on the Perceived Impact of Perennial Flooding on Livelihood Activities of Rural Dwellers of Orashi Region of Rivers State.

The education sector was also not spared. Damaged infrastructure and waterlogged schools caused disruptions to learning.

Housing units, most of which were made of poles and mud, were damaged in one way or another, forcing households to relocate to higher grounds and migrate to other alternative areas.

The results from the study established that households lost several both productive and nonproductive assets (both directly and indirectly), making them more vulnerable. This finding corresponds to a similar finding by Saleh, Ur Rahman 2014 on the Impacts of floods on the lives and livelihoods of people in Bangladesh.

The results further show that the main coping strategies employed by households were shifting to higher grounds and migrating to other areas. It is clear from the findings that these coping strategies were partially effective. The coping strategies employed by households depend on several factors, some of which include the type of livelihood strategy an individual household will undertake.

Conclusion

Socio-economically, flooding hurts households through the destruction and damage to household staple crops and agricultural activities, which are the main livelihood and income for the households, resulting in reduced food availability, causing food insecurity among the households. This has also been attributed to a lack of early warning systems at the community level to alert them of impending floods.

The rising flood waters have caused an increase in snake bites among households as snakes get exposed to their habitats by the excess water. Destruction of the existing health facilities by floods has disrupted their functionality, and difficulty in accessing health services due to damage to roads and bridges as a result of floods has caused an increase in disease incidence due to lack of access to appropriate medication. Due to the contamination of water by the floods, Water-related diseases like diarrhea, skin diseases, malaria, typhoid, measles, and cholera have been on the rise.

The destruction of infrastructures like roads and health facilities, therefore, means that the community will not have access to health services, and once they are sick, they will not be able to be more productive in sustaining their livelihood options. A sick population will always be vulnerable to meeting their socioeconomic livelihoods.

Limitations of the Study

Limited access by vehicle to some of the areas within the study area as a result of the high level of flood waters, which eventually required movement on foot, which was time-consuming. Migration of flood-affected households from the study area to higher ground outside the study area. As a result of the persistent floods in the study area, which resulted in a poor harvest, most energetic household members most of whom are the household heads who are the targeted people for the interview using the household questionnaire were not available for the interview as they went out to seek for alternative source of livelihoods outside their place of residence to support their household members.

Recommendations.

1. Government, especially the local government, and key stakeholders should engage communities for them to move permanently to higher ground. This will prevent them from the increase in cases of snake bites attributed to floods, damage, and loss of household properties like stored food.
2. The relocation should go with the provision of all the necessary socio amenities such as schools, hospitals, infrastructure, water, and agricultural support for a period of two years to enable the households to settle. It is imperative to contemplate the implementation of substitute livelihood approaches in the recently established settlement.
3. The local government and community members should make use of the local knowledge of planning, preparedness, and response to floods through the construction of local dykes
4. Government and key Stakeholders should engage the communities and local authorities in making them aware of the flood risk in view of climate variability and the establishment of early warning systems at the local levels. Dissemination of disaster early warnings will help vulnerable communities move to safer areas before the disaster happens.
5. There should be a deliberate policy by the government to compel communities, especially in rural areas, to build houses and health service infrastructures using durable materials and away from the flood-prone areas. This will limit the destruction and damage to houses and health facilities, thus reducing disease incidence.

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List of abbreviations

IPCC- International Panel on Climate Change.
FEMA - Federal Emergency Management Agency.
COVID-19 - Coronavirus disease of 2019.
IOM – International Organization for Migration.
RRC – Relief and Rehabilitation Commission.
IRNA – Initial Rapid Need Assessment.
FEWSNET – Famine Early Warning System Networks.
FAO – Food and Agriculture Organization.
GDP – Gross Domestic Product.
JAM – Joint Aid Movement.
UNOCHA – United Nations Office for Coordination of Humanitarian Affairs.
WHO – World Health Organization
IDP – Internally Displaced People.
WASH – Water, Sanitation, and Hygiene
JRS – Jesuit Refugee Service
HFO – Health Foundation Organization.
MOH – Ministry of Health.
FGD – Focus Group Discussion.
KII – Key Informant interviews.
SPSS – Statistical Package for Social Science.
SMEs – Subject Matter Experts.
UNOSAT – United Nations Satellite Centre.

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Availability of data.

Data used in this study are available upon request from the corresponding author.

The author's contribution.

BOJA designed the study, conducted data collection, cleaned and analyzed data, drafted the manuscript, and KAKD supervised all stages of the study from conceptualization of the topic to manuscript writing and submission.

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