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3 **1 Pastoral Community Coping and Adaptation Strategies to Manage Household Food**
4 **2 Insecurity Consequent to Climatic Hazards in the Cattle Corridor of Uganda**
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8 **4 ABSTRACT**
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10 **5** Establishing short and long term measures that pastoral and agropastoral households use to
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12 **6** ensure they have access to food in periods of climate extremes could provide insights into
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14 **7** ways to support households in similar conditions. Using semi structured elicitation, 15
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16 **8** purposively selected participants from case households and 13 community leaders, in the
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18 **9** central cattle corridor of Uganda were interviewed in January to February 2013. Thematic
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20 **10** analysis revealed four coping strategies: harvesting immature food crops, selling off cattle,
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22 **11** searching for alternative water sources and using alternative non-production based means to
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24 **12** access food. The three adaptation strategies identified were: diversifying livelihood activities,
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26 **13** changing agricultural practices and investing in alternative water sources. Several adaptation
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28 **14** strategies were related to incremental crop system changes, to maintain the existing way of
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30 **15** practice. However some strategies were transformational, like formerly specialised livestock
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32 **16** keepers taking on crop farming. Some strategies presented environmentally erosive effects; a
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34 **17** mechanism to curb this would be to evaluate the opportunity cost of diversification and
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36 **18** transformative practices in relation to incremental adaptation. Insights gleaned could assist
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38 **19** researchers to consider aspects for in-depth adaptation analysis and inform on how policies
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40 **20** and institutions in Uganda could be used to facilitate, rather than undermine, pastoralists’
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42 **21** coping and adaptation; and thus guide development interventions to strengthen food security.
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49 **22**
50 **23 Key Words**
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53 **24** Coping, Adaptation, Climate Extremes, Household Food Insecurity, Pastoralists
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3 **1 INTRODUCTION**
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8 **3** Food security is threatened both by trends in climate change, and by climate shocks (Gregory,
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10 **4** Ingram, & Brklacich, 2005). Farmers and other rural populations manage these threats to food
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12 **5** security in various ways, with one important concept being that of “coping strategies” (see
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14 **6** for example, Farzana et al. (2017)). A further distinction between “coping strategies” and
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16 **7** “adaptation” has been a very important one in development literature (see Davies (1996)).
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18 **8** This paper uses the distinction to explore how pastoralists and agro-pastoralists in Uganda
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20 **9** manage threats to their food security subsequent to climate variability. The inadvertent
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22 **10** undermining of local coping and adaptive strategies has been identified as one of the barriers
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24 **11** to appropriate national policies and frameworks that would support local-level adaptation
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26 **12** (Niang et al., 2014). This paper considers how policies and institutions in Uganda could be
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28 **13** used to facilitate, rather than undermine, coping and adaptation, and thus strengthen food
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30 **14** security.
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36 **15** Coping strategies are adopted ex-post to climate shocks and other environmental risks and
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38 **16** have been described as what households and communities use in the short-term, based on
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40 **17** available skills and resources to face, manage and recover from adverse conditions,
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42 **18** emergencies or disasters (Pasteur 2011 cited in Frankenberger, Langworthy, Spangler, and
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44 **19** Nelson (2012)). The low ability of some households to cope with climate shocks means that
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46 **20** the employment of coping strategies that might be available to others, is at too high a cost or,
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48 **21** simply, unavailable to some (Gregory et al., 2005). This article considers such adverse
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50 **22** conditions to be the effects of changes in climate variability and associated extremes on food
51
52 **23** security, and gives more attention to households and individuals than national level. Food
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54 **24** security is thus a situation that exists when all people, at all times, have physical, social and
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56 **25** economic access to sufficient, safe and nutritious food that meets their dietary needs and food
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1 preferences for an active and healthy life.’ (FAO, 2002b). In the event of need for longer
2 term solutions to adverse effects on food security, households have to adapt. On the other
3 hand~~The current study considers adaptation to be is~~ an adjustment (permanent change) in
4 ecological, social, or economic systems in response to actual or expected climatic stimuli and
5 their effects or impacts (Burton et al., 2001). Hepworth and Goulden (2008) note that any of
6 the actions that households take to adapt depend on the ability to diversify livelihoods which
7 can be limited by insufficient natural, social and financial or physical capital.~~The climate-~~
8 ~~related stimuli for which adaptations are undertaken are not limited to changes in average~~
9 ~~annual conditions; they include variability and associated extremes (Burton et al., 2001).~~

10 Adaptive mechanisms are measures used to manage and minimize the risk from chronic food
11 insecurity and recurring situations; in the past they involved diverse and flexible techniques of
12 exploiting ecosystem resources, occupational diversification and reliance on food exchange
13 within and among social groups (ACF, 2010; Messer, 1989). Coping strategies may become
14 adaptive strategies when people are forced to use them over a run of bad years and across
15 seasons rather than just at the worst time of the year (Anderson, Morton, & Toulmin, 2010).
16 In food security analysis, a household may be ‘vulnerable’ to a particular hazard, but not
17 necessarily at ‘risk’ of food insecurity (Grillo & Holt, 2009). Such a situation arises because
18 the household may still be able to effectively respond, or cope, by increasing reliance on
19 livelihood strategies not affected by that hazard, or by drawing down on stocks or savings. In
20 this context, FEWSNET (2010) note that analysis is as much about people’s sources of cash
21 as about their production of food. For example in rural Africa to day, the poorer people are,
22 the more they normally rely on purchasing staples in the market, because they cannot get
23 enough food-crops from the land they have, or enough milk from the livestock they keep – so
24 food security also has a ‘demand side’ — the capacity of farmers and herders to buy food
25 (FEWSNET, 2010).

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3 1 A range of adaptation options exist however they are insufficiently researched (Porter et al.,
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5 2 2014). This gap exists in the context of the pastoral and agropastoral communities in the cattle
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7 3 corridor districts of Nakasongola and Nakaseke districts of Uganda, where there is no
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9 4 documented qualitative research on the strategies households take to manage food insecurity.
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11 5 The current study thus explores the question: What short term measures and longer term
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13 6 adjustments were employed by pastoral and agro-pastoral households to manage food scarcity
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15 7 between 2011 and 2013? This article aims to give a qualitative report on pastoral households'
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17 8 actual efforts towards accessing food given changes in climate variability; and integrate
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19 9 recommendations on how this information can be used by stakeholders targeting adaptation as
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21 10 a measure to improve management of household food insecurity. Unless stakeholders take
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23 11 note of pastoralists' existing coping and adaptation strategies within the context of a
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25 12 community, they will not be able to put in place relevant and acceptable interventions
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27 13 including supportive policy to manage food insecurity.
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37 16 *Study Area*

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39 17 Uganda is located on the East African Plateau at latitudes of 4°12'N & 1°29'S, with a tropical
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41 18 climate moderated by its high altitude (UBOS, 2009). The cattle corridor of Uganda is a strip
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43 19 of rangelands with an estimated area of 84,000 sq.km. It runs from the northeast – Moroto to
44
45 20 the southwest - Mbarara district. Pastoralists and agropastoralists along the cattle corridor
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47 21 constitute a significant group of small-scale family enterprises investing in the business of
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49 22 rearing livestock: they are Uganda's main livestock private sector (Krätli, 2010). The area's
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51 23 economy is driven by rain-fed agricultural and livestock husbandry; although a few
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53 24 pastoralists have bought land, many tend to graze on other people's land with or without
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55 25 permission (GOU, 2011). Types of land occupancy in the cattle corridor include large private
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57 26 ranches 20-70 sq.km leased from public land; small ranches of 5-10 sq.km in former
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1 government ranching schemes now with unclear title; squatter ranches of people with no land
2 title and squatter ranches now being surveyed and divided into units of 30-100 ha, with people
3 who will need to apply for titles (GOU, 2011).” In their study, Nsubuga, Olwoch,
4 Rautenbach, and Botai (2014) detected a significant decrease in rainfall associated with an
5 increase in interannual variability in the cattle corridor of Uganda. Such increase in inter-
6 annual variability poses a threat to pastoral activity given that this region is predominantly
7 pastoralist.

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11 **Figure 1 Uganda’s Cattle Corridor Districts Shaded and the Study Area with Thickened**
12 **Borders**

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14 The study area is Nakasongola and Nakaseke districts (**Figure 1**) in the central part of the
15 cattle corridor. Rather than being analysed comparatively, the two districts are considered as
16 a single study area since their ~~The~~ ~~expanse~~ ~~of~~ ~~the~~ ~~two~~ ~~districts~~ has diverse agro-ecological and
17 production systems (perennial, annual and pastoral), ~~).~~ They thus exhibiting characteristics
18 that allowed assumption of a reasonable unit of study without having to expand into a large
19 area of the cattle corridor.

20 According to Nimusiima et al. (2013), the daily temperature in the study districts ranges from
21 25 to 35°C maximum and from 18 to 25°C minimum throughout the year while in the 50 year
22 period 1961 to 2010, the March-April-May (MAM) seasonal rainfall has been variable and
23 therefore less predictable. addition this season seemed to be merging with that of September-
24 October-November (SON) into one of May to November (Nimusiima et al., 2013).

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3 1 For the 2021-2080 period - relative to the 1981-2010 - projections over the cattle corridor
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5 2 districts of Nakaseke and Nakasongola, show both a mean annual temperature increase of 2.5
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7 3 to 6.0°C; and a shift in rainfall with the usual dry season of December to February (DJF) now
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9 4 becoming wetter while the SON period shows higher seasonal rainfall than the usual major
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11 5 rainfall season of MAM (Nimusiima et al., 2014).
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18 8 **METHODOLOGY**

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21 9 The study done in January to February 2013 is based primarily on a case-study approach, with
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23 10 in-depth qualitative interviews carried out with a small number of households, in which, “the
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25 11 real-life context was used to examine the contemporary phenomenon” (Yin, 1981), of
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27 12 households’ coping and adaptation strategies. A case-study approach was considered a means
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29 13 of getting a deeper understanding of issues that arose during a preceding household
30
31 14 questionnaire survey. This was in contrast to considering the case study as a pilot method to
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33 15 be used only in preparing for larger surveys (see Flyvbjerg (2006)). We present thematic
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35 16 descriptions to capture, in-depth, the household coping and adaptation strategies to manage
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37 17 food insecurity concerns.
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44 20 *Participants*

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47 21 The original study design was to interview 26 households purposively selected based on facts
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49 22 obtained from questionnaire surveys that had been carried out in three separate climatic
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51 23 seasons between 2011 and 2013. For a detailed description of these questionnaire surveys
52
53 24 refer to M. Mayanja, Rubaire-Akiiki, Morton, Young, and Greiner (2015). In line with
54
55 25 recommendations by Moench and Dixit (2004) regarding case studies, analysis of data from
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57 26 those surveys provided interesting descriptions and striking facts that guided case household
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3 1 selection and further research. In addition, 22 key informants were also selected including
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5 2 local village and opinion leaders as well as employees from government and non-government
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7 3 institutions.

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10 4 At the end of the data collection process, the respondents that had actually participated were
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12 5 15 from selected households and 13 key informants. By gender these 28 interviewees turned
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14 6 out to be 61% female and 39% male, **Table 1** summarises the household categories and actual
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16 7 participants.

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20 9 In the context of this study community given that there were no existing data, the exploratory,
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22 10 qualitative, descriptive thematic approach was appropriate for looking at adaptation because
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24 11 we wanted to identify patterns other than provide a definitive assessment of coping and
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26 12 adaptation strategies. The categorisation of case households and key informants based on
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28 13 different criteria enabled identification of strategies that may be specific to a livelihood
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30 14 system or subgroups. However, limitations of the study included: elicitation of data at only
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32 15 one period in time which could affect categorisation of what were coping as opposed to
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34 16 adaptation strategies; while relying on information from memory of respondents also
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36 17 increases the tendency of recall bias. Furthermore, although there were set criteria and
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38 18 categories of participants, the reliability of the data may have been decreased by the unequal
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40 19 number and gender of respondents for each. These aspects may compromise validity of
41
42 20 generalising the findings over longer periods of time and to similar communities. However,
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44 21 validity is enhanced by the fact that data from household cases was triangulated with data
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46 22 from key informants and from review of documents relevant to the subject.

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3 **1** *Data Collection and Analysis*
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5 **2** A semi structured elicitation technique, as described by Middlestadt, Bhattacharyya,
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7 **3** Rosenbaum, Fishbein, and Shepherd (1996), was used to collect data from the small
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9 **4** purposive sample, so that to some extent participants could be asked a set of similar questions
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11 **5** and leave open the possibility of comparisons. Each participant was allowed to articulate their
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13 **6** responses in as complete a manner as possible and asked further relevant questions for
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15 **7** clarification. The questions concerned:
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19 **8** • Experiences of changes in climatic variation including extremes in previous 5 year period
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21 **9** • Food security challenges faced
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23 **10** • Non-usual / non-agricultural activities carried out by household members to ensure access
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25 **11** to food
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27 **12** • Permanent investment to manage future food insecurity
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31 **13** In order to capture a distinction between coping and adaptation, the lead author asked
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33 **14** participants to explain in detail about:
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- 35 **15** • Short term actions to manage food insecurity (coping strategies), mainly reactive after
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37 **16** changes in climate variation
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39 **17** • Longer term adjustments (adaptation strategies) in anticipation of future changes in
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41 **18** climate variation including extremes
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43 **19** • External support to coping and adaptation strategies
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49 **21** The lead author administered all the interviews, between January and February 2013, in the
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51 **22** presence of a research assistant who kept records, both by written script and digital voice
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53 **23** recorder, as well as asked occasional questions to clarify participants' responses. The
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55 **24** participants were questioned in the local language (Luganda and few cases Luruuli) and the
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3 1 responses were recorded on the scripts in English. The local language voice-recorded
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5 2 responses were transcribed in English.
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10 4 Data were analysed both manually and with ATLAS.ti v.5.2.0 (1993-2016) software. While
11
12 5 reading through each script, we generated initial codes, subsequently searched for themes
13
14 6 among codes then reviewed and named the themes. Thematic analysis was used to examine
15
16 7 and record patterns across the data sets (Clarke & Braun, 2013), since themes would be
17
18 8 important in describing the household coping and adaptation strategies. Data from Nakaseke
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20 9 and Nakosongola districts were treated together. In reporting data direct quotes are provided
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24 10 and source of quote identified by person then area by parish and district.
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32 14 **RESULTS**

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34 15 Four themes were identified during analysis for coping (short term) strategies: alternative i.e.
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36 16 non-production based food access; selling off cattle; harvesting food crops prematurely and
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38 17 searching for alternative sources of water. On the other hand, three thematic areas were
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40 18 identified related to adaptation strategies (long term adjustments): diversifying livelihood,
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42 19 changing agricultural practices and investing in alternative water sources.
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46 20 47 21 **1. Coping Strategies**

48 49 22 **1.1 Non-production based food access**

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51 23 During times of food scarcity some households cope by buying food using income from various
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53 24 sources, for example one participant said:
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3 1 “We had to buy food and beans for sauce. I did odd jobs to get money, I particularly
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5 2 cut trees and burnt charcoal for other people”. (Agro pastoralist, Namikka-
6
7 3 Nakasongola)
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10 4 In other cases elderly parents are supported by their grown up children who give them food,
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12 5 one respondent noted: “...that is how I managed, when the children did not bring then I would
13
14 6 stay hungry - would I steal?” (Pastoralist, Kalyabulo-Nakaseke)
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18 19 8 **1.2 Selling off cattle** 20 21 9

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23 10 Some pastoralists said when the drought persisted:
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26 11 “We would sell cattle then buy food. For example a 50kg bag of maize flour - would
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28 12 cost about Ushs 80,000/= (24 US dollars), although in normal circumstances it costs
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30 13 50,000/= (15 US dollars)”. (Pastoralist, Ngoma-Nakaseke)
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34 35 15 36 16 **1.3 Harvesting food crops prematurely** 37 38 17

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40 18 Both during extreme rains and during long periods of sunshine some agro-pastoralists cope by
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42 19 early harvesting of crops.
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45 20 “Especially in 2012 even cassava less than a year old was rotting, so we were forced to
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47 21 cope by harvesting it early and selling off tubers which were still fine”. (Agro
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49 22 pastoralist, Namikka-Nakasongola)
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52 23 My mother decided to harvest the immature sweet potatoes and made “kasedde” [sliced
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54 24 and sun dried sweet potatoes] instead of leaving them to rot in the gardens”. (Agro
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56 25 pastoralist, Nalukonge-Nakasongola)
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3 1 The premature harvesting was not exactly about the food crops , for example cassava, being
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5 2 immature but they were harvested earlier than desired as a coping strategy to prevent them
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7 3 being affected by climatic extremes if left in the soil un-harvested – as is the norm for keeping
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9 4 root crops for future consumption.
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17 7 **1.4 Searching for alternative sources of water**

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19 8 A participant during one excessive drought period: “... *had to use a truck to fetch water from*
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21 9 *a distant valley tank for our cattle to drink*”. (Pastoralist, Buwana-Nakaseke). While some
22
23 10 households can afford to do this, others temporarily migrate and settle with the cattle in areas
24
25 11 closer to the lakeside, completely abandoning their homes through the dry season. However,
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27 12 some households split their families for example a pastoralist in Ngoma-Nakaseke said:

30 13 *“There was no pasture and cattle used to walk long distances to drink - but eventually*
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32 14 *some of us migrated with the cattle to another area and stayed there for some time -*
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34 15 *although part of the family stayed here”.*
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43 19 **2. Adaptation Strategies**

44 20 **2.1 Diversifying livelihoods**

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46 21 As an adaptation strategy, taking on alternative means of livelihood includes activities like
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48 22 trading in maize or other crops; exploiting natural resources – like agropastoralists fishing eels
49
50 23 from swampy areas; and engaging in casual labour. The latter includes working as herdsmen
51
52 24 for others during long drought periods when there was no activity on their own farms. A parish
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54 25 councillor for women in Nakayonza- Nakasongola said youth were mainly involved in brick
55
56 26 making and; while a village local council chairman in Namikka-Nakasongola mentioned

1 charcoal burning as being taken up by several households which was how they get money to
2 buy food when the harvest is not good enough. This was further confirmed thus:

3 *“I started charcoal production from which I got income and I bought food for my*
4 *family during that drought time. I also work as a herdsman for people who own cattle*
5 *and they give me milk part of which I sell for income.”* (Agro-pastoralist, Namikka-
6 Nakasongola)

7 8 9 **2.2 Changing agricultural practices**

10 Change in agricultural practices takes different forms as described in the subsequent sections

11 ***Crop system changes***

12 These changes involve not following the usual planting season, growing drought resistant
13 crops and complete change in crops grown where both pastoralists and agropastoralists adopt
14 new and improved varieties of non-traditional but higher income earning crops like eggplants,
15 green pepper mushrooms and *“...particularly those aged 20 years and above grow fruits –*
16 *especially watermelon, oranges and mangoes - while others usually plant pine trees for poles*
17 *to sell and firewood to cook.”* (Parish councillor for women, Nakayonza- Nakasongola).

18 When rains are good agropastoralists plant some vegetables like aubergines, *doodo*
19 (amaranthus) and pumpkins. In addition to this, based on services by the NAADS
20 program”..... *the people were taught to plant improved seed varieties of food crops. We were*
21 *told to practice improved farming like plant maize and beans in lines so that we could harvest*
22 *larger quantities”.* (Male elder born and lived in Mifunya-Nakasongola).

23
24 During drought *“...we recognised that the only crop that has not been affected much by the*
25 *prolonged period of sunshine is millet. So we grow it year in year out and store in our*
26 *granaries.”* (Agropastoralist, Namikka-Nakasongola).

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4 **2** Another strategy adapted is that participants do not follow the “normal” planting season.
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6 **3** Particularly since the food shortage period in 2011, people have delayed the planting season
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9 **4** which would normally start in March:

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11 **5** *“We normally get intense sunshine during March and April and we do not get a good*
12
13 **6** *harvest from our crops – so we now plant between August and September then we get*
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16 **7** *good harvest from those crops. (Female Agropastoralist, Nakayonza-Nakasongola).*

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18 **8** On the other hand, a male elder in Mifunya-Nakasongola explained that those people who want
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20 **9** to catch the March season encourage each other to plant earlier so that by the time the rains
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23 **10** start they have already cultivated food crops.

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25 **11**
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27 **12** ***Indigenous and adopted technologies***

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29 **13** A coordinator of a nongovernmental organization (NGO) funded pastoralist support project in
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31 **14** Nabiswera-Nakasongola reported uptake of practices like “..... *soil and water conservation*
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33 **15** *technologies for which we are satisfied that the farmers we handle have mostly adopted what*
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36 **16** *we introduced. Adaptation has included regularly making contours as well as compost manure*
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39 **17** *for their gardens”.*

40
41 **18** There were also reports that “...*some pastoralists who have taken on crop farming have put up*
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43 **19** *wire mesh or chain-link fences to protect their crop gardens from wild animals; I own 640 acres*
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46 **20** *of land, I have put a wire mesh on one side of my land but still protection is minimal since all*
47
48 **21** *the land is not surrounded.”. (Social group leader, Buwana-Nakaseke). However such fencing*
49
50 **22** *is a limited practice since it is only affordable to a few; if pastoralists to prevent other grazers*
51
52 **23** *from encroaching on their pastureland and if agropastoralists to protect their crops against cattle*
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55 **24** *and wild animals.*

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57 **25** Post-harvest preserving and storage of food crops so that they keep longer - using both
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59 **26** indigenous and modern ways - is practiced by some households to manage food insecurity.
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3 1 “Most families harvest the cassava and sweet potatoes, slice then sun-dry them to
4
5 2 make *kasedde* for storage in addition to millet”. (Male, village local council leader,
6
7 3 Namikka-Nakasongola)

4 Some households have granaries while “...instead of using granaries, people have store rooms
5 in their houses. For example, they may store maize on cobs or remove it from cobs, either way
6 they pack it in sacks and keep them raised off the ground by first placing wooden board pieces
7 on the ground. Sacks of cassava are also stored”. (Male district councilor, Kikyusa-Nakaseke)

8

9 ***Changed practices with respect to livestock***

10 Some agropastoralist households take to rearing increased numbers of small stock, according
11 to the village local council (LCI) Chairperson, Namikka- Nakasongola:

12 “Those families that can sell off part of their crop harvest normally invest in buying
13 livestock like pigs, chicken and goats. These tend to be more worthwhile to keep in the
14 dry season and are easily sold for income”.

15 The NAADS program was reported to support commercial / market oriented enterprises:

16 “At least six farmers in this central ward - a township - have taken on chicken
17 (broiler) rearing – NAADS is also encouraging them to take on Kuroiler chicken
18 breeds which grow bigger and are more disease resistant than broiler chickens”.

19 (NAADS Coordinator, Ngoma-Nakaseke).

20 Some pastoralists opt to rear higher producing crossbreeds of cattle and decrease their
21 indigenous cattle herds to remain with herd sizes that do not overgraze the land in the long
22 run.

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25 ***Transformational practices***

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3 1 Pastoralists who realise that animal rearing is not enough to ensure food security, adjust
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5 2 practices and take on growing food crops. They plant improved seed varieties of high yielding
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7 3 drought resistant crops especially cassava.

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10 4 *“At the beginning of 2012 we decided to go into crop growing so that we would have*
11
12 5 *food other than depending on buying all the time and from the bad experience we had*
13
14 6 *the previous drought period. We set up a banana plantation and a cassava garden and*
15
16 7 *also grew some groundnuts”.* (Female Pastoralist, Ngoma-Nakaseke District).

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18
19 8 *“The lack of food we faced during the drought period made us decide to grow crops -*
20
21 9 *we do not want to feed on posho alone - it is not good food”.* (Female Pastoralist,
22
23 10 Buwana-Nakaseke).

24 25 26 11 27 28 12 29 30 13 **2.3 Investing in alternative water sources**

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33 14 Households invest in different types of alternative water sources, for example a female
34
35 15 pastoralist in Kamusenene-Nakaseke said:

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37 16 *“On our land, we constructed a more permanent valley tank using a tractor - previously*
38
39 17 *we had temporary hand dug ones - it cost around Ushs 4 to 5 million (US \$ 1200 to*
40
41 18 *1500). This one does not go dry - even though pastures are dry at least the cattle have*
42
43 19 *water.”*

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46 20 While in order to *“.... store larger quantities of water, we made the small valley tank on our*
47
48 21 *land much bigger and wider”* (Male Pastoralist, Ngoma-Nakaseke).

49
50 22 Alternatively, some households individually invested in building concrete rain water
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52 23 harvesting tanks to store water for domestic use, an elderly male in Kigweri-Nakaseke
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54 24 explains that others *“..... collectively excavated valley tanks in different locations, investing*
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56 25 *about Ushs 2 million for each. They hired tractors privately or borrowed government ones to*
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3 1 *facilitate the excavation which would ensure they had more permanent water sources for their*
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5 2 *cattle.”*
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11 5 **DISCUSSION**
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13 6 The study identified four thematic areas for coping and three for adaptation strategies and
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15 7 most participants divided them up more or less the same way. Strategies in the current study
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17 8 that are apparently coherent with existing literature include coping by searching for water and
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19 9 buying food; and adaptation by selling labour, increasing number of small stock, altering
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21 10 planting dates and storing food, (Porter et al., 2014; Rufino et al., 2013). It is however notable
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23 11 that diversifying livelihoods, migration and selling off cattle were flagged as both coping and
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25 12 adaptation strategies. This finding conforms with earlier observations by Davies (1996) about
26
27 13 the ultimate impossibility of distinguishing coping from adaptation – particularly since coping
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29 14 strategies can become adaptive strategies when they are used every year to fill the food gap.
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36 16 In the current study, mobility has been considered as a coping strategy – since it occurs after
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38 17 the hazard – in this case drought. The study community move cattle herds to search for
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40 18 alternative water sources and return to base when conditions are better (transhumant
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42 19 practices). The different patterns of migration as explained by the study community accord
43
44 20 with the findings of Davies (1996) who noted that the availability of a range of coping
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46 21 strategies affects how households use migration to manage climatic-related risks to
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48 22 livelihoods and food security. The indication of seasonal and temporary migration practiced
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50 23 by the study communities is similar to the observation by Warner and Afifi (2014) who noted
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52 24 that different forms of migration are facilitated or hindered by various characteristics
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54 25 including land ownership, access to livelihood diversification options and age. Such
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56 26 characteristics bring to mind the issue of adaptive capacity. The degree to which migration
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3 1 improves the adaptive capacity lies in the sensitivity of migrant-sending households to
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5 2 climatic factors, and the risk management options and strategies they can access when facing
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7 3 climatic stressors that affect food production and consumption (Warner & Afifi, 2014).
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11 5 Diversification has been defined as an increase in the number of productive activities for a
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13 6 particular production unit (Pedersen & Benjaminsen, 2008). From the current study, the
14
15 7 adaptation strategies that involved taking on alternative means of livelihood correspond quite
16
17 8 closely to the notion by Frank Ellis (2000), that diversification is by necessity rather than
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19 9 choice; the money earned is not only used to buy food but also meet other livelihood
20
21 10 requirements. According to Pedersen and Benjaminsen (2008), the diversification argument is
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23 11 flawed for mobile pastoralists (in the northern Sahel) because the logistical and organisational
24
25 12 costs of combining different modes of livelihood are large and easily become insurmountable
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27 13 for a single household. This argument may not hold in the context of the current study area,
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29 14 participants clearly put it that by diversification households get money to buy food when the
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31 15 harvest is not good enough. The diversification activities are also linked to contextual
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33 16 vulnerability where adaptation strategies may not be linked to any particular extreme climate
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35 17 manifestation, i.e. are in response to a wide variety of economic, social, political and
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37 18 environmental circumstances (O'Brien, Eriksen, Nygaard, & Schjolden, 2007). In that case as
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39 19 argued by F. Ellis (2000) diversity enhances the resilience of hazard-prone livelihoods by
40
41 20 spreading risk and increasing the options for substitution between diverse livelihood
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43 21 components It is therefore possible that for the study community, the beneficial effects of
44
45 22 diversification as a strategy far outweigh its disadvantages; the task of policy is therefore to
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47 23 facilitate rather than inhibit diversity, by improving mobility, providing information, reducing
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49 24 entry barriers, and dismantling controls on private small-scale business activities (Frank Ellis,
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51 25 2000).
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5 **2** Adaptation by crop system changes for example the tree growing activity being implemented
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7 **3** in the study community, fits within the priority intervention strategies of Uganda's climate
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9 **4** change National Adaptation Programme of Action (NAPA) – to promote tree-growing in
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11 **5** farmland (NAPA, 2007) – and if supported by sustainable implementation processes would
12
13 **6** counteract the effects of charcoal burning. Adoption of improved technologies in the growing
14
15 **7** of varieties of non-traditional agricultural crops, emulates the notion by Easterling et al.
16
17 **8** (2007) that adaptation to climate change impacts in the food system has focused on adaptive
18
19 **9** actions related to agriculture. More specifically change to crop types like high value fruits and
20
21 **10** vegetables targeted for sale to towns and Kampala city, is not only an opening for income
22
23 **11** generation but also an indication of the growing role of urban food influences on the
24
25 **12** agropastoral communities. However, as noted by Hepworth and Goulden (2008), such
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27 **13** alternative livelihood activities are still dependent on natural resources either directly or
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29 **14** indirectly (trading activities), which resources are also heavily influenced by climate. .
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37 **15**
38 **16** With respect to changes in livestock related practices, contrary to a study of 12 sites in East
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40 **17** Africa, by Rufino et al. (2013), where most households planned to increase flock and herd
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42 **18** sizes mostly for commercial purposes and as a form of savings, households in the current
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44 **19** study area, where about 60% of the farm households are engaged in agropastoralism, mostly
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46 **20** wanted to decrease number of cattle to minimise overgrazing. These differences indicate that
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48 **21** approaches are location and context specific, thus to enhance their efficiency, consideration of
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50 **22** the status of the ecosystem has to be made. Such consideration will enhance deliberate effort
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52 **23** to fight erosive strategies so as to protect the environment and ensure sustainable management
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54 **24** of food insecurity.
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3 1 The selective cultivation of drought resistant food crops – which is already practiced within
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5 2 the community - can be an entry point for interventions promoting more water efficient
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7 3 sorghum or millet varieties. It would be a consideration of the recommendation by Wasige
8
9 4 (2009), to develop crop varieties that will take more heat units and be more adaptable to
10
11 5 climate change. Concentrating on drought resistant crops is intended to avoid adverse climate
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13 6 impacts and represents practices described by Füssel and Klein (2006) as implementation
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15 7 activities to reduce sensitivity or moderate relevant non-climatic factors.
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17 8 Adoption of technologies like soil and water conservation is notably an example of private
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19 9 decisions for adaptation, undertaken by individuals and NGOs in the form of community-
20
21 10 based adaptation (Dasgupta et al., 2014). However, with such an initiative already existing in
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23 11 this study community, research investments into integrated management of land and water
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25 12 resources, as recommended by Cooper et al. (2008), have the potential to reduce vulnerability
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27 13 to climatic effects on food security.
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35 15 The effectiveness of postharvest crop preservation practices observed in this community
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37 16 would need more observational evidence so as to enable improvement of adaptation options
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39 17 further down the food system, a notion advanced by Niang et al. (2014). With such evidence,
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41 18 institutional support for postharvest adaptation could then be enhanced, for example food
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43 19 preservation and storage facilities could benefit from support within the NAPA framework
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45 20 which stresses the strong need to promote traditional food preservation technologies (NAPA,
46
47 21 2007). As argued by Ziervogel and Ericksen (2010), policies and institutions underpinning
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49 22 adaptation to climate change across the spectrum of food security issues need to be
50
51 23 prioritized. Minimal focus on adaptation across the food system means that there may be
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53 24 underestimation of adaptation opportunities and benefits (Porter et al., 2014). To promote
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55 25 adaptation that covers the whole food system, aspects that could benefit from institutional
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3 1 support to this pastoral community are: ensuring people have ability to pay for food when
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5 2 necessary and that food options remain relevant to local cultural, psychological, and
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7 3 biomedical needs. Another aspect would be taking up opportunities to support postharvest
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9 4 adaptation – for example cultivating postharvest skills and knowledge amongst service
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11 5 providers and key stakeholders as well as improving techniques for assessing food stocks
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13 6 (Stathers, Lamboll, & Mvumi, 2013). In addition, innovations could consider adaptation
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15 7 opportunities in harvesting, drying, storage, pest management, processing and preparation to
16
17 8 ensure food safety (Stathers et al., 2013), even as the overall target remains managing food
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19 9 insecurity. Such opportunities should, for example be consciously addressed by agricultural
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21 10 extension services, however an audit by the Uganda National Farmers Federation (UNFFE)
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23 11 identified a gap and recommended that the government’s National Agricultural Advisory
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25 12 Services (NAADS) programme include climate change adaptation technologies in its
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27 13 technology package (Mangheni, Kisauzi, & Miiro, 2013).
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31 15 “There is medium confidence (limited evidence, high agreement) that crop adaptations can
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33 16 lead to moderate yield benefits (mean of 10 to 20%) under persistently drier conditions
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35 17 (Deryng et al., 2011)” Porter et al., 2014 p.515. The current study thus considers crop
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37 18 adaptations not only as important in managing food insecurity but that differentiating
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39 19 incremental and transformational adaptation strategies is vital, since it affects how we
40
41 20 approach adaptation and integrate it into planning and policy (Field et al., 2012). For
42
43 21 example the act of changing planting time, as mentioned in this study, is an adjustment that
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45 22 can be described as incremental adaptation, where actions are aimed at maintaining the
46
47 23 essence and integrity of the existing technological, institutional, governance, and value
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49 24 systems (Noble et al., 2014). On the other hand, specialised pastoralists starting to grow crops
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51 25 constitutes transformational adaptation which, according to Noble et al. (2014), seeks to
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53 26 change the fundamental attributes of systems in response to actual or expected climate and its
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1 effects. The change is at a scale greater than incremental adaptation. Access to information
2 (knowledge dissemination) about adaptation, technology development, credit services, farm
3 assets and markets are critical for helping African farmers adapt (Dasgupta et al., 2014).
4 Providing those services is not at first sight transformational, but under current African
5 conditions of political neglect and under-resourcing of as well as relative lack of good
6 practice in such services to pastoralists (Mangheni et al., 2013; Morton, 2017), providing
7 them would in effect constitute transformational adaptation. The services could be
8 implemented within the framework of the national agriculture policy given its existing
9 objective to improve access to key markets and market information as well as facilitate
10 construction of appropriate agro-processing and storage infrastructure (MAAIF (2013). The
11 current study findings call for establishing further knowledge about current practices,
12 opportunities for improvement as well as supportive institutions and policy frameworks to aid
13 implementation. Such adaptation facilitation activities like establishment of institutions and
14 legal frameworks for action as well as exploiting other available mechanisms for expanding
15 the adaptive capacity of human and natural systems will ensure successful adaptation (Füssel
16 & Klein, 2006; Klein et al., 2014). As recommended by Porter et al. (2014), farmers,
17 policymakers and other stakeholders should be engaged in evaluating the opportunity cost of
18 transformative, pro-active, planned adaptations relative to to incremental adaptation.
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20 A number of strategies mentioned in the current study were efforts at individual household
21 level, not necessarily planned in advance – a demonstration of mostly reactive, autonomous
22 adaptation – and with negligible support from government, a phenomenon generally observed
23 for the African continent (Bossche & Coetzer, 2008; Niang et al., 2014). While there are
24 farmer-owned institutions like Uganda National Farmers Federation (UNFFE), they are
25 characterised by limited capacity to deliver and/or demand for delivery of services (MAAIF,

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3 1 2010). Mechanisms to improve this situation should be exploited because, as highlighted by
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5 2 Wright et al. (2014), farmers' organizations are mechanisms for linking between national-
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7 3 level and community-level adaptation and success factors include tailoring of adaptation
8
9 4 technologies to local contexts. In addition more effective and efficient knowledge
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11 5 management to support adaptation is needed. This should be facilitated by established
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13 6 policies and structures through which different players - development partners, government,
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15 7 civil society, private sector, to farmers - must be well directed and coordinated (Mangheni et
16
17 8 al., 2013). For example, in considering support to individual adaptation initiatives (like
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19 9 investing in alternative water sources), Ziervogel and Ericksen (2010) proposed national
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21 10 policies subsidising rain water harvesting facilities as an encouragement to investment by
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23 11 households. In the current context, there is a supportive framework in the climate change
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25 12 adaptation program of action that recommends promotion of appropriate and sustainable
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27 13 water harvesting, storage and utilization technologies (NAPA, 2007). What should be done to
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29 14 support the community is to enhance implementation of such technologies within the
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31 15 guidance of this framework.
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39 17 Uganda has local government agencies as well as national level institutional, policy and legal
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41 18 frameworks. Such include statutory bodies like National Agricultural Advisory Services and
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43 19 legal frameworks like the Uganda Forestry Policy 2001, Food and Nutrition Policy 2003,
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45 20 National Adaptation Programs of Action, Land Investment Framework 2010-2020 as well as
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47 21 the National Agriculture Policy 2013. Therefore, what was expected but not mentioned during
48
49 22 the study was that adaptation activities to counteract effects of extreme climatic events on
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51 23 food security were publicly supported. Except for mention of agricultural skills training
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53 24 under the NAADS program, there was no report on any adaptation facilitation activities. This
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55 25 implies that adaptation strategies implemented with support of government institutions are
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57 26 either unknown or sparsely felt at grass root level. In relation to this Mangheni et al. (2013)
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3 1 cited not only the inadequate awareness among key stakeholders about the NAPA but also the
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5 2 slow progress in its implementation. For example although Uganda's NAPA 2007 provides a
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7 3 policy framework to develop and promote drought tolerant and early maturing plant varieties
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9 4 and animal breeds, the limited budget it provides for adaptation to drought can hardly develop
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11 5 a comprehensive breeding programme for new crop varieties well adapted to drought
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13 6 (Mangheni et al., 2013). There is thus a need for support to sustainable implementation of
14
15 7 required intervention strategies within the NAPA framework. Insights from this study point to
16
17 8 the need to target opportunities that will enable pastoralists and agropastoralists fine tune
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19 9 sustainable adaptation practices in context of current change in climate variability. Such a
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21 10 strategy has been mentioned as needing institutional support from district, state and national
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23 11 bodies (Frank Ellis, 2000; Ziervogel & Ericksen, 2010), for example in terms of help with
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25 12 market access and provision of safety nets.
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33 14 The authors opted for the definition of coping as what households and communities use in the
34
35 15 short-term to face, manage and recover from adverse conditions; while adaptation was
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37 16 considered as permanent change in response to actual or expected climatic stimuli and their
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39 17 effects or impacts (in Frankenberger et al 2012, Burton et al 2001). A limitation of this study
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41 18 could be that in questioning the community about the strategies we did not establish if the
42
43 19 categories coping and adaptation were distinctly defined locally too. However supporting
44
45 20 evidence that the distinction provided was valid and understood, is that the informants worked
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47 21 with it by producing interesting and coherent examples. From a stand of policy makers at
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49 22 community and national level, the themes highlighted in this study present household
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51 23 initiatives whose implementation could justifiably be supported. Aside from that, the
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53 24 recommendation by ODI (2009), that to reduce vulnerability of pastoral communities
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55 25 planners and policy-makers should review the growing constraints to their traditional coping
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3 1 options, should be taken into consideration. Nevertheless for better decision making about
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5 2 strategies to enhance effectiveness in management of household food insecurity in pastoral
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7 3 communities, home-grown initiatives need to be examined within the context of existing
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9 4 national policy frameworks. From an academic viewpoint, the same themes indicate aspects
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11 5 that can be considered for in depth adaptation analyses, for example when using adaptation
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13 6 strategy based methods to study climate variation related food insecurity.
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11 Pastoral households have their coping and adaptation strategies to manage food insecurity,
12 albeit some better than others. Short term strategies to manage food insecurity after changes
13 in climatic variation include: harvesting food crops prematurely; alternative other than
14 primary production based means to access food; selling off cattle (normally an asset); and
15 search for alternative sources of water - which may involve temporary migration with
16 livestock. Long term adjustments in anticipation of future calamities include diversifying
17 livelihood activities, changing agricultural practices and investing in alternative water
18 sources. These findings imply that there are existing community initiatives, policy
19 frameworks and supportive institutions. However, unless these aspects are assessed within the
20 context of a specific area and integrated into relevant development interventions, external
21 support will neither be relevant nor acceptable and may thus be unsuccessful. Adaptation
22 support could emphasise enhancing knowledge about current practices and supportive
23 institutions; making considerations of the ecosystem status, with subsequent deliberate effort
24 to fight environmentally erosive strategies; and providing support services to aid
25 implementation of sustainable practices to manage food insecurity.

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3 **Table 1 Description of Case Study Households and Key Informants**

Category & Criteria	Gender and No. of Respondents	Food Insecurity: Based on a CSI* obtained July 2012
Household Type 1: Only rear livestock (Pastoralists); Do not own land	Female: 2	Moderately Food Insecure: 1 <u>Extremely Food Insecure: 1</u>
Household Type 2: Pastoralists; Own farm or grazing land – <i>Mailo</i> ¹ tenure system	Widow: 1	Extremely Food Insecure: 1
Household Type 3: Rear livestock and grow food crops (Agropastoralists); <i>Mailo</i> farmland owners	Female: 2 <u>Male: 1</u>	Food Secure: 2 <u>Extremely Food Insecure: 1</u>
Household Type 4: Agropastoralists; Do not own land – but <i>Kibanja</i> holders ²	Female: 6 (3 widows) <u>Male: 1</u>	Food Secure: 6 <u>Extremely Food Insecure: 1</u>
Household Type 5: Transitioning from pastoralists to agropastoralists	Female: 2	Food Secure: 2
Key Informants		
Local Government Elected Leaders	Female: 1 Male: 4	-
Local Government Employees	Female: 1	-
Non Government Organisation Employees	Female: 1 Male: 1	-
Community Group Leaders	Female: 1 Male: 2	-
Elderly - lived over 50 years in the area	Male: 2	-

3 *Consumption Coping Strategy (CSI) is a measure of household food insecurity that was obtained for these
4 selected cases in a study by (M. N. Mayanja, Rubaire-Akiiki, Greiner, and Morton (2015)). The food secure (CSI
5 0-5), then the mildly (CSI 6-20), moderately (CSI 21-42) and extremely (CSI >42) food insecure
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¹*Mailo*: a customary form of freehold land tenure system confined to Buganda (central) and Bunyoro (western) Uganda

² *Kibanja* holders: Tenants on mailo land

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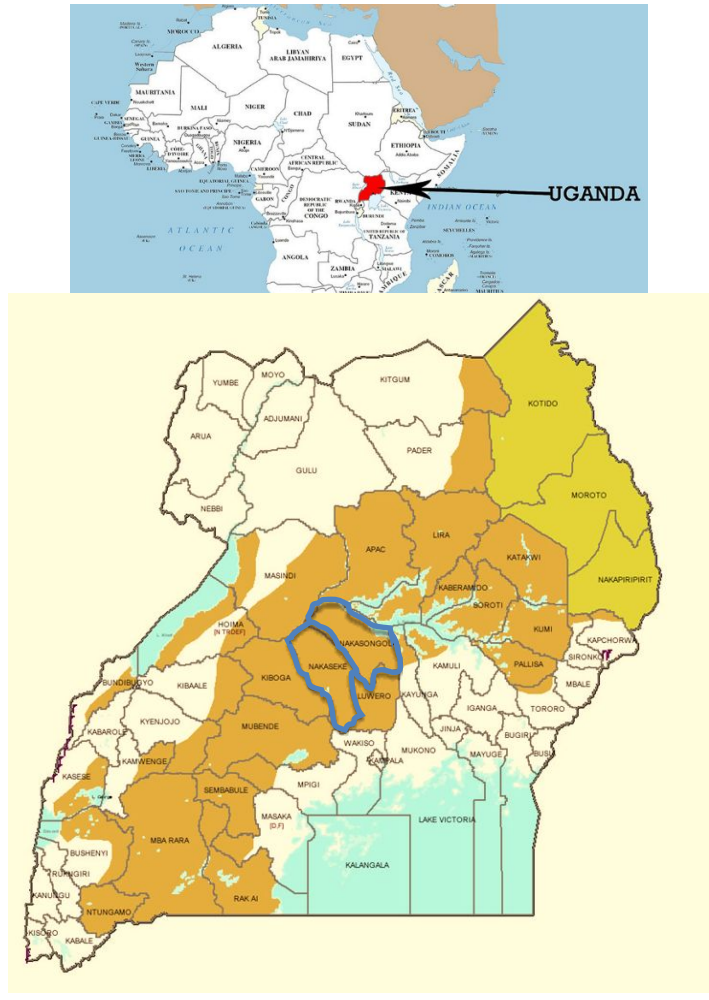


Figure 1 Map of Uganda with cattle corridor districts shaded: study area Nakasongola and Nakaseke districts have thickened borders