Info Note

Landscape mapping for upscaling CSA in the Nyando Basin, Kenya

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Key messages

- Projected decrease in the length of growing period (LGP) in combination with the terrain slope and low soil depth make upscaling of Climate-Smart Agriculture (CSA) all the more pressing
- Prevailing poverty and the informal nature of credit networks present potential constraints to upscaling of CSA
- Networks of inputs and outputs related to CSA seem to be capable of scaling
- Market access also seems to be favorable for scaling

Introduction

The Nyando Basin in South West Kenya has been an area where the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) has been actively promoting CSA interventions (see the Output Networks section). Upscaling of successful interventions is the next natural step to take. However, whereas small-scale interventions may be successful for individual farmers, upscaling may change the environment in which these interventions take place (system changes). Typical issues that need to be addressed under upscaling include economic impacts, agro-ecological impacts, and institutional impacts. For economic impacts, the central issue is whether output markets are able to absorb increasing amounts of CSA products (in the Nyando Basin among others goat, sheep and chicken products), whether input markets are able to supply larger quantities of required fertilizer, (improved) seed, and feed, and whether credit is available to invest at scale in improved seeds, planting of trees and soil and water management. To ensure sustainable upscaling, it may be necessary to reach out to new consumers, or new sources for inputs. Agro-ecological impacts refer to changing input requirements, predominantly of fodder, while institutional impacts relate to barriers that may exist in current laws and regulations.

To assess the current potential for upscaling, this note reports on a landscape mapping that has been carried out to prepare for the landscape modelling that will simulate different upscaling scenarios. Due to the multi-disciplinary nature of landscape mapping, many different approaches exist. Simensen et al. (2018) distinguish three main types: (1) biophysical mapping, (2) holistic mapping, with emphasis on socio-cultural elements, and (3) mapping based on *a* priori selection of geo-ecological and land-use related properties. In this note, we apply and refer to biophysical mapping and holistic mapping, because of data availability and because we feel that it provides useful insights in the potential for scaling. We end with preliminary conclusions on possible options and barriers for upscaling, including assessments of the potential to find new sources of inputs and outlets for outputs.

Biophysical mapping

The area of study is the CCAFS climate-smart village in Nyando. Figure 1 shows the location of the 10 x 10 km^2 block from which villages have been randomly sampled.

Sijmons et al. (2013) developed an atlas of the study area, describing, among others, altitude, soil types, agroecological zones (AEZ), land use, LGP, crop suitability and livestock production systems. Another source for the biophysical mapping is the report by Verchot et al. (2008) where we interpret their "Lower Nyando block" as being representative for our research area.

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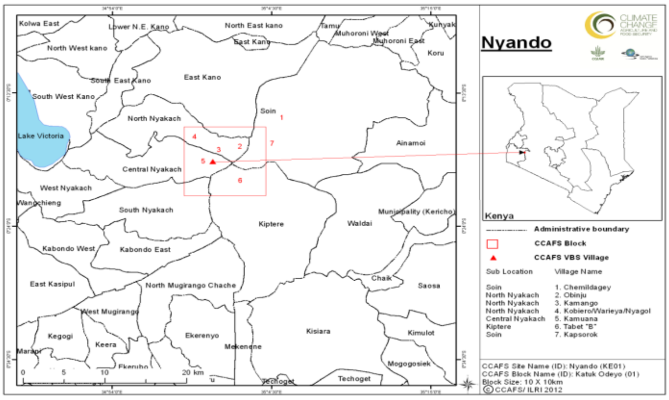

Figure 1 Location of CCAFS climate-smart village in Nyando, Kenya. Source: Mango et al. (2011)

The study area is characterized by lowlands, midlands and uplands, with altitudes varying between 1100 and 1800 meters (Verchot et al. 2008). The highlands are high potential areas, while the lower piedmont plains are often flooded and highly degraded, with gully erosion being a major problem (Verchot et al. 2008, Sijmons et al. 2013). Soil types in the area range from loam to clay, and there are widespread restrictions to soil depth, with over half of the area suffering from soil depths less than 20 cm (Verchot et al. 2008). The two characteristics point to the need for upscaling soil conservation measures. Land use is dominated by a combination of crops and livestock rearing, with a large portion of forests (Figure 2). This land use is consistent with crop suitability in the area, which indicates a medium-low to medium suitability, with a small area with medium-high suitability.

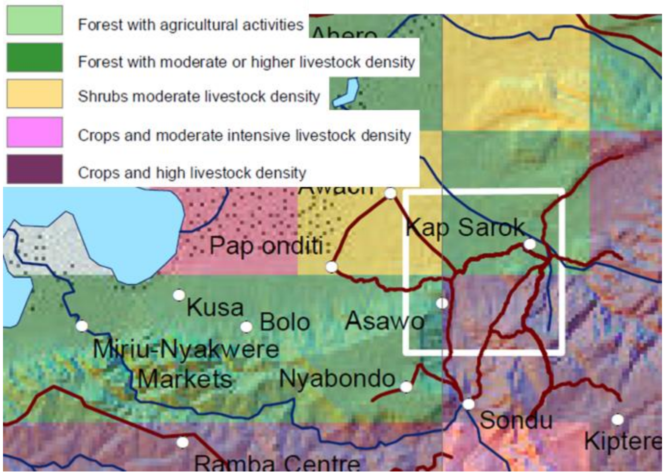

Figure 2 Land use in research area. Source: adapted from Sijmons et al. (2013)

In terms of livelihoods, the study area is divided into two zones (Figure 3), with poverty rates in 2013 of between 20-60% (Figure 4). Comparing the two figures, it is clear that the vertical watershed between the two livelihood systems is not reproduced in the poverty map. Hence, there is no one-to-one relation between systems and poverty, but there does seem to be an opportunity for improving the lives of many farmers if maximum use is made of existing potential, particularly in the Western Lakeshore Marginal Mixed Farming Zone.

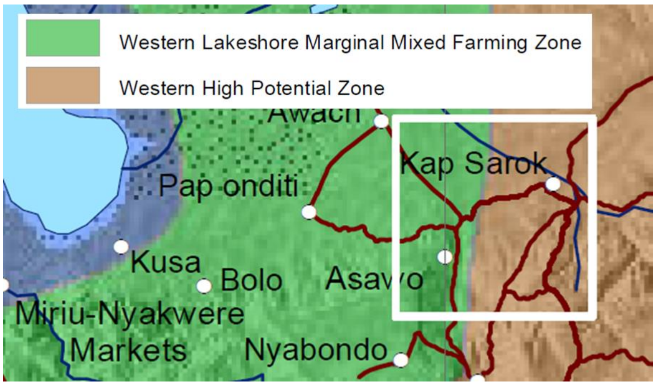

Figure 3 Livelihood zones in research area. Source: adapted from Sijmons et al. (2013)

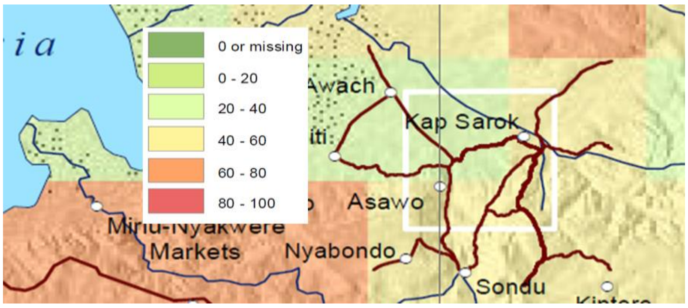

Figure 4 Poverty rates in research area. Source: Sijmons et al. (2013)

Considering the potential for upscaling, *market accessibility* is a key factor for both inputs and outputs. We return to this point in the social landscape mapping below, but here, we already note that, in terms of travelling time, market access in the lower Nyando region is quite good, with the exception of a few areas in the north and central area (Figure 5). The area has a relatively good road network, which allows for the development of market-oriented activities.

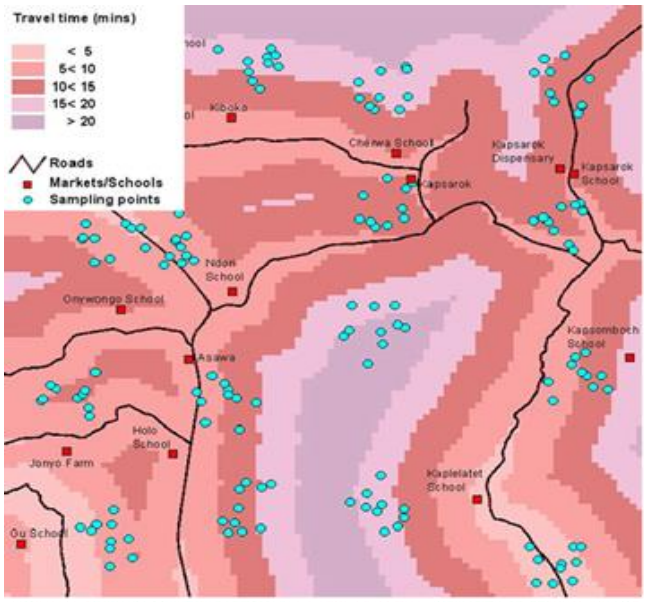

Figure 5 Market accessibility. Source: Verchot et al. (2008)

Projections for the area in terms of production potential generally are not favorable, particularly since the LGP is expected to decrease below the 90 days frontier needed for e.g. maize cultivation (projections for 2030, Sijmons et al. 2013). This means that rainfed cultivation will become increasingly difficult, and water management measures such as those promoted by CCAFS are crucial for farmers to maintain viable production levels.

Holistic mapping

Understanding the social landscape, or how people organize themselves on the land, is essential in defining the options for upscaling (e.g. see WRI 2018). For the purpose of upscaling, three elements are of particular importance: (1) to whom are actors connected in relation to acquiring necessary finance, particularly related to CSA, (2) to whom are actors connected in buying inputs, and, (3) to whom are actors connected in selling outputs, particularly of outputs related to CSA activities. Potential for upscaling increases as households already have many relations with outside and/or formal actors, such as input suppliers, financial institutions, aggregators, and decreases if households predominantly have economic relations within a small circle of friends, relatives and other actors within the village. Here, we look at each of the three network types separately, based on the Financial Diary data collected during weeks 11-41 of 2019.[1] In the figures, the size of the "balls" and the coloring reflect the value of the transactions made by the actor, except for the pivotal "Household" ball, for which the value has been set to zero to avoid scaling issues.

Lending networks

To upscale existing CSA initiatives, availability of credit is of vital importance. In addition to mapping the social landscape for lending in general, we focus on two specific reasons for lending: farming inputs and livestock. As Figure 6 and 7 highlight, current lending networks are dominated by informal sources and local connections. For livestock, the farmer association plays an important role, and this may therefore be a promising actor for upscaling livestock financing. For farming inputs, none of the current providers seem to be easily scalable, as all of them are informal and/or very local actors. Another point that needs to be mentioned is that only 19% of households have taken out a loan for farming inputs; an even smaller share (4%) has received a loan for livestock purchases. These low shares could indicate a barrier for scaling, when they are caused by barriers to lending.

Finally, it could potentially be the case that the category "other" would contain many formal sources; further checking of this category reveals, however, that dominant groups here are the church, and the use of money kept within the house. These results hence strengthen the conclusion on the informality of the sources for credit.Input networks

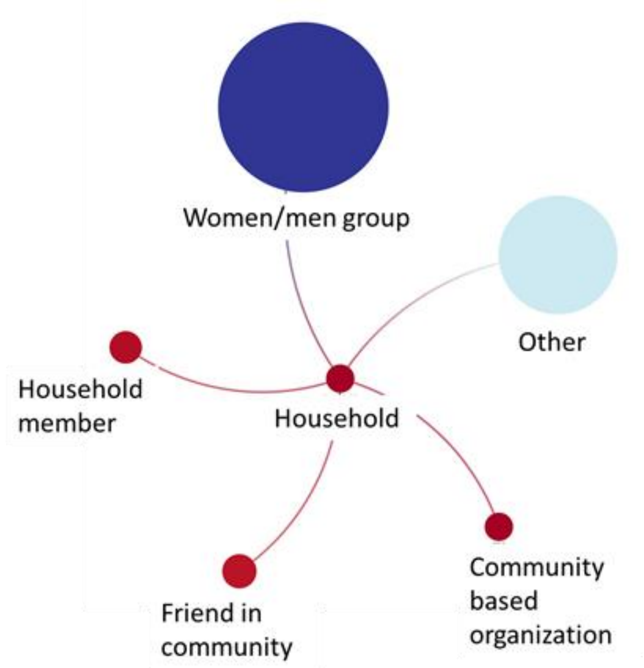

Figure 6 Top-5 of loan providers for farming inputs

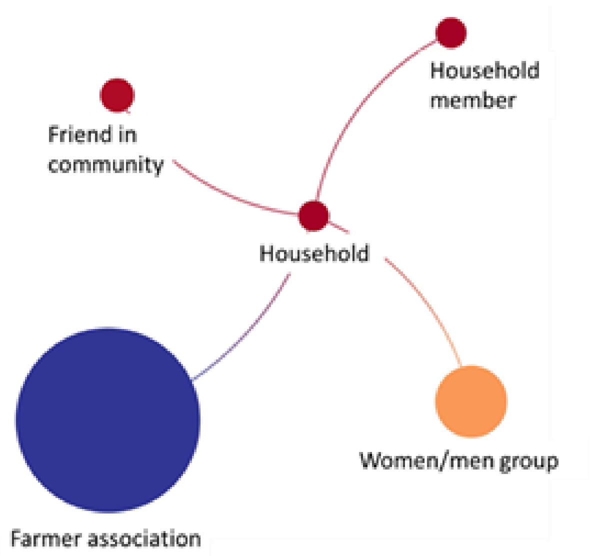

Figure 7 Top-5 of loan providers for livestock

Input networks

Upscaling of CSA initiatives requires availability of the required inputs. For crops, this includes particularly fertilizer and agrochemicals, while for livestock, availability of fodder (also in the dry season) and feed is vital. For agrochemicals and fertilizer, shopkeepers are the most important source, while also secondary sources (supplier, market vendor) seem to be well embedded in larger chains and hence scalable (Figures 8 and 9).

[1] All network graphs are made using the Kumu software (https://www.kumu.io/).

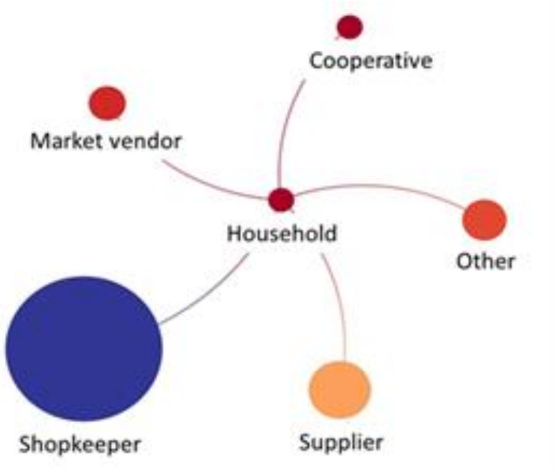

Figure 8 Top-5 of providers of fertilizer

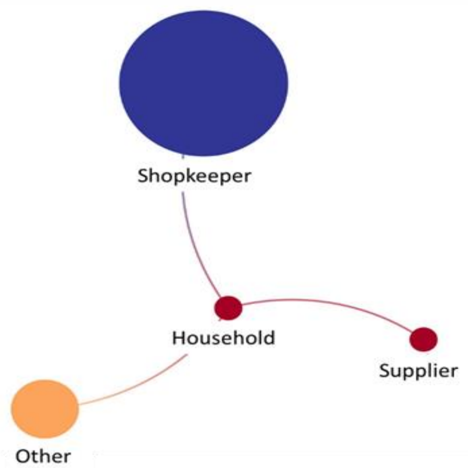

Figure 9 Providers of agro-chemicals

For fodder, the dominant source is the category of shopkeepers, again suggesting scalability (Figure 10). For feed, one of the important secondary sources includes “friends outside community,” an informal link that may not be easily scaled. However, shopkeepers again figure prominently, as do suppliers (Figure 11). In general, therefore, we conclude that input volumes for livestock can be scaled up.

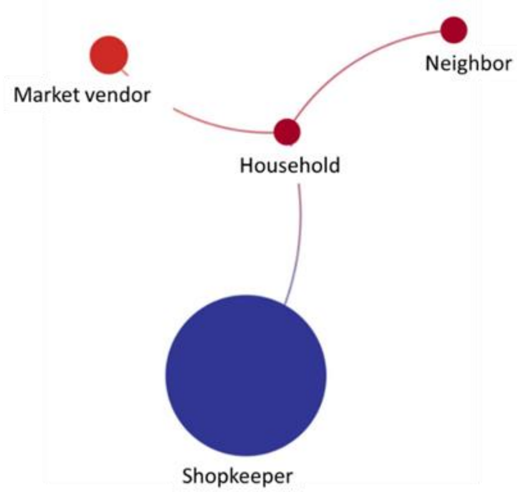

Figure 10 Providers of fodder

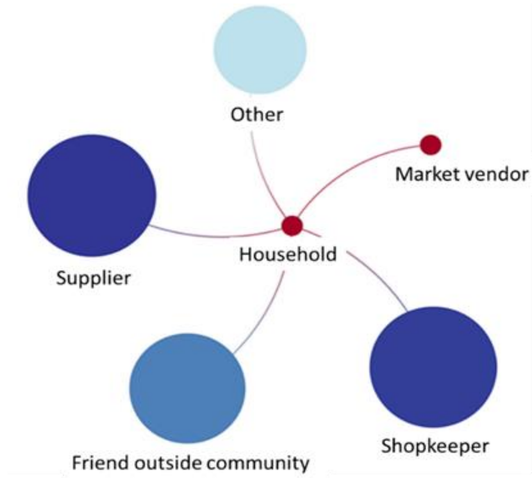

Figure 11 Top-5 of providers of feed

Output networks

The CSA interventions include the introduction of improved varieties of chicken, sheep and goats, and the use of improved seeds, planting of trees (e.g. mango) and soil and water management. Upscaling those interventions is possible only if the (products of) animals, crops and trees can be sold profitably to consumers. Hence, as for the analysis for inputs and loans, we present the current selling networks for the different produce, concentrating on chicken, goats, sheep and milk. For all four items, it seems that the dominant outlets are scalable as they do not rely on informal networks: “random” customers (strangers with whom the household does not have a special relation) and market vendors figure prominently among the destinations (Figures 12 to 15). Secondary outlets include more informal outlets, such as neighbors, and friends in or outside the community. However, in general, we conclude that the output volume of goat, sheep, chicken and milk is scalable.

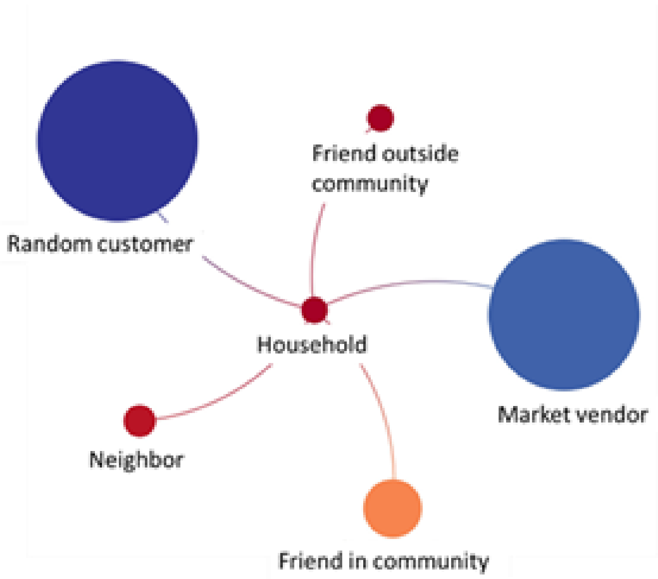

Figure 12 Top-5 destinations for chicken sales

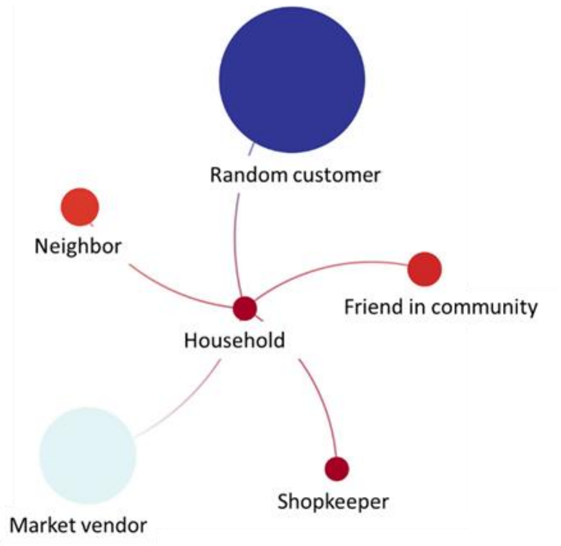

Figure 13 Top-5 destinations for goat sales

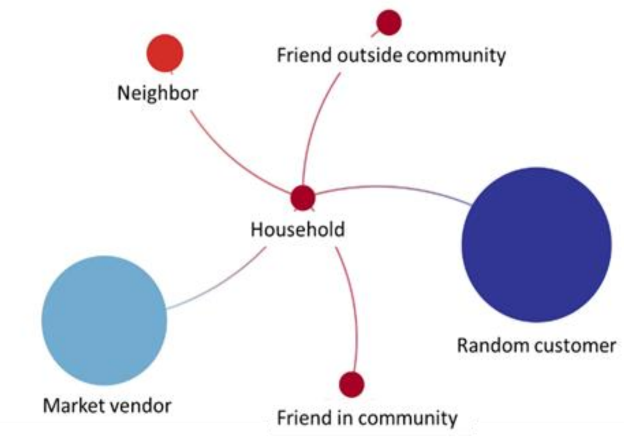

Figure 14 Top-5 destinations for sheep sales

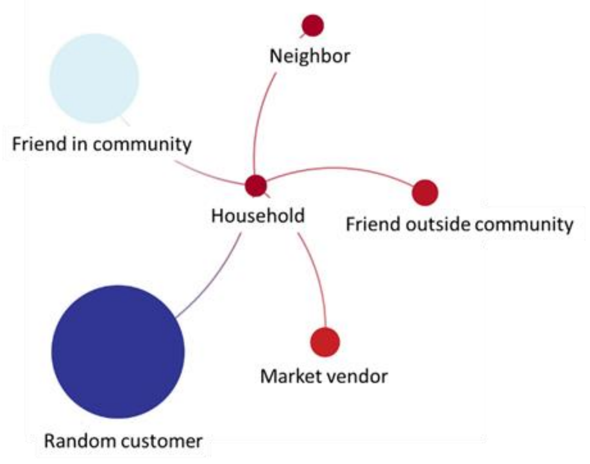

Figure 15 Top-5 destinations for milk sales

Conclusions and policy implications

The landscape mapping presented here provides an overview of the current physical and social setting within which the farmers and others in the Nyando Basin operate. Based on the physical mapping, we conclude that the projected decrease in LGP, terrain slope and low soil depth make upscaling of CSA all the more pressing. Poverty mapping suggests that prevailing poverty presents a potential constraint to upscaling of CSA. Accessibility of markets does not seem to be a major constraint. This is confirmed by the social mapping, since it seems that upscaling is primarily constrained by the sources of credit, and much less so by the possibility to upscale inputs or outputs. This indicates that for successful upscaling, first and foremost a change in the social system of credit provision is needed. We do need to point out that the data on which the social mapping is based does not span an entire year, which may distort the picture of dominant suppliers and customers as seasons change. This will remain a continuous focus of attention. We also note that the social mapping analysis is done at current levels of inputs and outputs, and hence, although the dominant agents in the networks seem to be potentially "scalable", we have not assessed the capacity of each of the sources or destinations in detail. Hence, inclusion of new sources of inputs and/or destinations for output remains a point of attention.

Further Reading

- Mango, J, Mideva A, Osanya W, Odhiambo A. 2011. Summary of Baseline Household Survey Results: Lower Nyando, Kenya. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org.
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- Verchot L, Boye A, Zomer R. 2008. Baseline report Nyando River Basin. International Centre for Research in Agroforestry, Nairobi.
- WRI. 2018. Mapping social landscapes. A guide to identifying networks, priorities and values of restoration actors. Washington DC: World Resources Institute.

This Info Note presents the landscape in which the climate-smart agricultural activities in Nyando, Kenya take place. It is part of the NWO-CCAFS research project "Climate-Smart Financial Diaries for Scaling in the Nyando Basin, Kenya," led by the Amsterdam Centre for World Food Studies, in consortium with CCAFS East Africa, Wageningen Economic Research and the University of Nairobi.

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