

SCENARIOS FOR DRYLAND DEVELOPMENT IN WEST POKOT, KENYA

- EXPLORING RESEARCH AND POLICY NEEDS

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Triple-L: The Triple-L research initiative is a multidisciplinary research initiative taking its base in the land-use and livelihood transformations that has taken place in West Pokot, Kenya, during the last three decades. These transformations are relevant and common to vast areas of drylands in Sub-Saharan Africa. Triple-L aim to analyze, understand and learn from this development.

Triple-L research initiative is a collaboration of partners based both in Sweden and Kenya and currently consist of representatives from the Swedish University of Agricultural Sciences (SLU), University of Gothenburg (GU), Lund University (LU), University of Nairobi (UoN), Jomo Kenyatta University of Agriculture and Technology (JKUAT), World Agroforestry centre (ICRAF), International Livestock Research Institute (ILRI) and the Vi Agroforestry. The Triple-L research initiative is working in close collaboration with actors and stakeholders from the West Pokot County, Kenya.

More information on the Triple-L research initiative available at www.triplel.se or by contacting Triple-L coordinators:

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CONTENTS

1. Introduction.....	5
1.1. An ongoing transformation of dryland systems.....	6
1.2. The Triple-L research initiative.....	8
2. Development of scenarios.....	9
2.1. Background brief.....	9
2.2. Scenarios as an instrument.....	9
2.3. Scenarios, assumptions and limitations.....	10
3. Dryland scenarios.....	12
3.1. Poverty persist.....	12
3.2. Rural-urban push-pull.....	13
3.3. Same, same, but worse.....	14
3.4 The crowded market.....	15
4. Workshop conclusions.....	17
4.1. Land restoration and improved resource- and agricultural management.....	17
4.2. Productive and sustainable agricultural and livestock production, and market development.....	18
4.3. Conflict management, security and equality.....	20
4.4. Dissemination, implementation and education of knowledge, technology and policies.....	21
5. Summary and prioritization.....	23
6. Voices from the Triple-L workshop.....	24
6. References.....	26

1. INTRODUCTION

This report describes the process and results of a workshop arranged by the Triple-L research initiative, focusing on the development of future dryland scenarios. It was held in Kapenguria, West Pokot County, Kenya on the 29th-30th of November, 2016. The workshop brought together researchers, representatives of non-governmental (NGO) and intergovernmental organizations (IGO) as well as county officials, mainly based in either Kenya or Sweden. The participants' field of expertise was transdisciplinary and included, among others, rangeland ecology, livestock science, politics, economics, soil and water science, extension, local leadership and administration. The aim of the workshop was to discuss ongoing research taking place within the Triple-L research initiative, explore possible future scenarios for dryland development in West Pokot, and based on these scenarios identify future research and policy needs.

The scenarios presented in this report should be viewed as structured, qualified guesses of different possible developments in West Pokot and similar drylands around the world, rather than the most likely or the most desirable developments. The scenarios presented in this report are foremost tools for exploring and identifying possible future land, livestock and livelihood research and policy needs.

Box 1. Workshop participants

Workshop conveners: Gert Nyberg, Swedish University of Agricultural Sciences and Per Knutsson, University of Gothenburg

Participants	Organisations		
Julia Wernersson	University of Copenhagen	Dereje Wakjira	IGAD
Eric Röhss	University of Gothenburg	Benjamin Lokorwa	Triple-L
Eva Wredle	Swedish University of Agricultural Sciences	Astrid Hedman	We Effect
Göran Bostedt	Swedish University of Agricultural Sciences	Laura Asperholm	We Effect
Anders Malmer	Swedish University of Agricultural Sciences	Evelyn Koskei	West Pokot County (WP)
Stephen Mureithi	University of Nairobi		Director of Agriculture
Richard Onwonga	University of Nairobi	Renold Juma	WP Livestock department
Collins Ouma	University of Nairobi	Carren Nastaki Kirungo	WP Water Department
Caroline Kawira	University of Nairobi	Elisabeth Kinug'ok	WP Agriculture Department
Deborah Muricho	University of Nairobi	Jacob Simatwa	Extension officer
Rebecca Kigwe	JKUAT, Jomo Kenyatta University of Agriculture and Technology	Michael Arekou	Extension officer
		John Arusha	Extension officer
Alfred Burian	University of Stockholm	Samuel Longoringole	Chief
Lonah Mukoya	Vi Agroforestry	Joseph Loree Yarn	Chief
Oscar Kvamme	Vi Agroforestry	Jacob Lemtukei	Chief
William Makokha	Vi Agroforestry	Samuel Kapelinkorok	Assistant Chief
Bramwell Soita	Vi Agroforestry	Joseph Loriso	Assistant Chief
Petter Nordqvist	Vi Agroforestry	Stephen Lokato	Assistant Chief
Isabelle Ostovary	Vi Agroforestry	Emmanuel Lomwatum	CLMC

1.1. An ongoing transformation of dryland systems

Drylands in Kenya have traditionally been utilized by pastoral communities within the context of communal tenure systems (Nyberg et al. 2015). However, many drylands have a history of overgrazing, land degradation, recurrent famines and droughts, low productivity and land conflicts. Increasing population pressure have, together with other factors, often led to a transition of land management in semi-arid drylands from pastoralism towards more sedentary agropastoral livelihoods based on private property (Nyberg et al. 2015). Approximately 40 percent of the available land area in Sub-Saharan Africa is classified as drylands, which are utilized by 25 million pastoralists and 240 million people depending on agropastoral livelihood strategies. In Kenya, drylands cover 22 percent of the total land area (Wairore et al. 2015).



The establishment of enclosures have led to an increased vegetation cover (Photo: E. Röhss)

At the heart of the transformation of the pastoral livelihood system towards agropastoralism is the use of enclosures to rehabilitate degraded land and as intensification of grazing, fodder and crop production. In East Africa, the practice of enclosing land takes many forms, including the physical fencing of small and medium sized plots for private or communal use (Mureithi et al. 2010).

To understand this transformation, there is an increased need for interdisciplinary research as well as capacity building among researchers, policy makers local/national administrations and dryland herding/farming practitioners in order to better understand address the human the dynamics of the emerging agropastoral livelihood systems.

Box 2. West Pokot County

West Pokot is one of Kenya's 47 counties established by the 2010 Constitution of Kenya. The county is situated in the north-western part of the country bordering Uganda to the West, Trans-Nzoia and Marakwet Counties to the south and Turkana County to the north and east (Bostedt et al. 2015). The county covers an area of 9 169.4 km² and has a projected population of 631 231 (2013) and an annual population growth rate of about 5.2 percent (West Pokot County Government 2013). The altitude of West Pokot County varies greatly resulting in large variations in climate and agro-ecological zones with annual rainfall in the lowlands and the highlands measuring 400 mm and 1 500 mm, respectively (Nyberg et al. 2015).

Agriculture is the backbone of the West Pokot County economy and consists of a combination of agropastoralism and mixed farming systems in areas with higher altitude and more traditional pastoralism and subsistence crop production in lower areas. The livestock kept in the county are (descending order) cattle, goat, sheep, donkey and newly introduced camels, and the main crops produced are maize, beans, sorghum and millet (West Pokot County Government 2013). There is an ongoing trend towards privatization and sedentarization through the use of rangeland enclosures in communal lands resulting in a transformation of traditionally pastoral based livelihood strategies to agropastoralism (Bostedt et al. 2015).

Enclosures and agroforestry was introduced to the West Pokot County in the late 80's by the Swedish NGO Vi Agroforestry, in an effort to rehabilitate degraded land and intensify production in the area. While the initial adaptation of enclosures in West Pokot was slow, enclosures nowadays dominate the landscape in some parts of the county. This change coincided with a shift in the local tenure regime away from a communal tenure regime towards individual land tenure rights. The ongoing research conducted by the Triple-L initiative, alongside testimonies by local residents and authorities, have revealed a remarkable development during the last 30 years in West Pokot, including increasing vegetation cover, population increase, socio-economic and infrastructure development, as well as a more regulated and productive livestock and livelihood system. Enclosures, as a land management system, have been instrumental in this transition.



The view from mount Morpus reveal a landscape dominated by enclosures (Photo: E. Röhss)

1.2. The Triple-L research initiative

The multidisciplinary research initiative, Triple-L, was established in 2013 in an effort to mobilize agricultural, natural and social science research on the ongoing transformation of livelihoods and land uses witnessed in the West Pokot County, Kenya, during the last three decades. To date the initiative has produced six papers published in scientific journals, three reports as well as twelve master theses conducted both by Kenyan and Swedish students.

So far, the research conducted within the Triple-L has focused on analyzing and understanding the transformative development experienced in the West Pokot County and on the interactions between enclosures, human behavior, ecosystem services and socio-economic development etc. The new knowledge is applied in the work of local agropastoralist, authorities and NGOs. The research is not only important for the West Pokot County but also for similar drylands in Kenya and elsewhere.

Box 3. Ongoing research within the Triple-L research initiative

Livestock and identity: How livestock practices such as disease management, breeding, insurance, migration and livestock watering, renegotiates what it means to be livestock keeper today and in the future in terms of identity and state subjectivities.

Population growth: The effect of population growth and climate change on land management and tenure regimes. What positive and negative impacts these effects may have on livelihood strategies and socio-economic resilience.

Socio-economic analysis: Opportunities and challenges to the resilience of pastoral livelihoods in West Pokot County in terms of participation, marginalization and drought, as well as market development.

Household nutrition: The impact of enclosures and agroforestry practices on household nutrition, food security, food consumption behavior and welfare.

Saving and borrowing behavior: Evaluation of monetary training systems, saving and credit types and the use of saved/borrowed capital among agropastoralist in West Pokot County.

Institutional design: How enclosures and land tenure regimes are established through a combination of old and new institutional arrangements, the effect of agency and socio-economic outcomes.

Soil chemistry: Comparing enclosure and open field management to elucidate the effect of enclosures on top soil carbon stocks, greenhouse gas emissions and bacteria/fungi population in the soil.

Pasture and livestock quality: Analyze of the quality of pastures, including agroforestry trees, within enclosures in terms of protein, fiber and energy, as well as of the phenotypic and genetic character, herd structure and breeding strategies of livestock in West Pokot.

Gender effects: Enclosures have enabled husbands together with cattle to stay at, or near, home, thereby inflicting some changes in gender roles (Karmebäck et al 2015). Agriculture have become more diversified and created new niches for women to independently sell some farm produce. Other effects of the transition and the increased agricultural commodification are also studied.

2. DEVELOPMENT OF SCENARIOS

2.1. Background brief

Before the workshop participants started working on developing dryland scenarios, they were briefed on the research conducted by the Triple-L and Vi Agroforestry, and the developments and changes witnessed in the West Pokot county during the last 30 years. This included experienced changes such as population increase, increased climate variability, enclosure development, improved infrastructure, market development and livelihood diversification. Workshop participants were furthermore informed about the Intergovernmental Authority on Development (IGAD) work in relation to pastoralism and drylands in East Africa. IGAD deliberated on the projected challenges and opportunities for the region in the future including a general lack of development, cross-border mobility, loss of biodiversity, value chain development, environmental degradation and the governance of land.



William Makokha, Vi Agroforestry, explains the importance of trees in land management (Photo: E. Röhss)

In addition, Madam Evelyn Koskei, West Pokot County Director of Agriculture, provided the workshop participants with general information about the West Pokot County as well as the West Pokot County's view on research, research needs and dissemination of knowledge.

2.2. Scenarios as an instrument

The aim of the workshop was to explore a wide spectrum of scenarios for the future development of the drylands of West Pokot County, and based on these scenarios, to explore future challenges and opportunities related to drylands, as well as identifying critical knowledge and policy gaps in need of future research.

The scenarios were developed through group discussions based on the diverse expertise of the workshop participants. The discussions were divided into two steps; first, different scenarios were identified by exploring the possible trajectory of key drivers influencing drylands in West Pokot. Then the details for each scenario were developed further and explored through in-depth group discussions by scrutinizing:

- Potential environmental effects in the drylands and their effects on humans regarding land use and livestock/agricultural practices, likely to occur under scenario X
- Key challenges and opportunities that may derive from the effects under scenario X
- Knowledge and science needed under scenario X and how research can enhance the opportunities and limit the challenges under scenario X

- Key policies needed under scenario X and how governance can enhance the opportunities and limit the challenges under scenario X

Key research issues identified in this process are intended to guide scientists in future research planning and research application writing. Key policy issues identified are hoped to guide local farmers, stakeholders and policy makers in the development of enabling policies and regulations.

Group discussion, exploring key drivers for identifying dryland scenarios in West Pokot (Photo: E. Röhss)



2.3. Scenarios, assumptions and limitations

The main drivers for dryland development discussed were climate change, population development and economic development, all in relation to their effect on land use, agriculture and livestock patterns. Whereas some effects may occur rapidly, most effects on land use, agriculture and livestock practices will develop gradually over time. To fully understand the research and policy needed for future dryland development, a long-term perspective is needed and consequently the time perspective for the scenarios was set to the year 2050.

Despite the importance of global structures and drivers for the development of drylands in West Pokot County, the focus of the workshop was set on the local scale. This does not mean that global structures and drivers were ignored during the discussions, but rather that they were directly related to the local context of the West Pokot drylands. To make sure that the scenario development was not hampered by too much complexity, some assumptions in relation to key drivers were discussed:

Climate change is presumably the most exogenous driver for future development of drylands in West Pokot County, with limited possibility for local actors to affect the direction in which the future climate and weather patterns will take. More important for the future effects of climate change in West Pokot County is the efforts of global leaders, and the implementation

of the COP 21 agreement aiming to mitigate the impact of climate change by limiting the global temperature increase to maximum 2 degrees Celsius and to strive for a 1.5 degree Celsius increase (UN 2015). West Pokot County has already experienced climate changes in terms of less predictable rains and more frequent occurrence of severe droughts and floods. The workshop discussion therefore concluded that future dryland development in West Pokot is depending on whether the global efforts mitigating climate change is successful and the climate stabilizes or if it is unsuccessful and the climate variability increases. Increased climate variation included both a generally drier scenario and a scenario with larger variations (including occasional floods) since many of the issues relating to livelihoods would be problematic in a similar way for larger variation and for a generally drier climate, e.g. crop failures, fodder availability crisis.

Population development. West Pokot County has experienced a rapid population increase with an annual population growth of 5.2 percent. The population in West Pokot County was 512 690 in 2009 (KNBS 2009) and with a projected population of 777 180 in 2017 (West Pokot County Government 2013). Despite this projection the general feeling among residents of West Pokot are that families are decreasing in size, simultaneously as more people migrate to urban centers such as Kapenguria, Nairobi and other Kenyan cities. Urbanization may, however, be counteracted by the recent devolution of power experienced in Kenya since the 2010 constitution (Munya et al. 2015). The population of West Pokot County will likely continue to increase in the future, although a decreased rural population also was considered as a possible development.

Economic development at the global scale may be hard to predict. Still, at the local scale in West Pokot County, the economic development will be dependent upon the effects of climate change and population development, and people tend to adapt to the conditions they are faced with. There is no indication of decreased demands of land or agricultural and livestock produce. This, together with recent economic and infrastructural development experienced in West Pokot County since the 2010 constitution, leads to the assumption that the local economic development in West Pokot County will be positive for the foreseeable future.

Based on the discussions and assumptions made in the workshop, four basic dryland scenarios were identified and developed: Poverty persist; rural-urban push-pull; same, same but worse; the crowded market (box 4).

Box 4. Dryland scenarios constructed

- | | |
|--|---|
| 1. Poverty persist: Increased climate variability and a decreasing rural population in West Pokot County | 2. Rural-urban push-pull: A stable climate and a decreasing rural population in West Pokot County |
| 3. Same, same but worse: Increased climate variability and an increasing rural population in West Pokot County | 4. The crowded market: A stable climate and an increasing rural population in West Pokot County |

3. DRYLAND SCENARIOS

3.1. Poverty persist

In this scenario, global efforts to combat climate change have been unsuccessful and the drylands of West Pokot are experiencing an unpredictable climate with more frequent and more severe droughts and erratic rainfall. The unpredictable and harsher nature of the climate leads to a rural to urban migration and a general depopulation of the drylands in Kenya, including West Pokot County.

Few investments will be made in infrastructural development of the county, and little progress will be achieved in the development of the agricultural sector. There will be a growing scarcity in water and pasture resources due to the harsher climate conditions. This leads to a lower efficiency, less intensive production and a decline in the produce diversification experienced earlier in the agricultural sector. Pastoral migration will experience an upsurge with increased migration in search for both water and pasture, and a re-composition of livestock herds towards more drought resistant animals such as goats, sheep and camels. Due to erratic rainfall and reduced agricultural management, most land will be either underutilized and overgrazed; thereby the risk for severe land degradation will increase.

The demographic composition of the drylands of West Pokot County will shift, with young men leaving the rural areas in search for job opportunities and other men temporally leaving the area during the migration season. This will increase the burden for women to include not only the household but also production of daily livelihoods. People remaining in rural areas will to a larger extent depend on remittances from urban family member and maybe on relief assistance. The increased livestock migration and the scarcity of water and feed resources may lead to increased levels of intra- and inter-community conflicts over access rights to natural resources, as well as an increased number of livestock rustling cases. There may be increased spread of human and livestock diseases due to the increased migration.



Sheep and goats at market in Chepararia (Photo: E. Röhss)

To avoid land degradation and to ensure the sustainability of drylands under this scenario, it was concluded that more research is needed on how to improve land restoration practices, secure pasture resources and vegetation cover. Knowledge is needed on how to secure water resources and harvest water for times of drought. The increased importance of livestock and pastoralism requires new knowledge on improved breeding techniques, development of the livestock value chain, and monitoring of animal diseases. Furthermore, early warning systems need to be developed, both for droughts and floods.

The changing demographical composition and the increased importance of pastoralism in the West Pokot County will increase the need for research and policies targeting the empowerment of women as well as an adaptation of social services to the reality of seasonal migration e.g. mobile schools during migration season. Livestock herding needs to be fully recognized as a business practice and a livestock insurance needs to be introduced to enable herders to move from subsistence herding to become livestock entrepreneurs.

3.2. Rural-urban push-pull

In this scenario, global efforts to combat climate change have been more successful and the climate in the drylands of West Pokot County is basically the same as today's climate. A combination of increased levels of education among the youth, a positive urban economic development and a desire for a better economic situation, moving to towns and cities have become attractive for many people, especially the youth. This leads to a rapid urbanization of Kenya's larger cities and county capitals, as well as depopulation of rural areas.

A general trend towards privatization in combination with a depopulation of the drylands in West Pokot County leads to a land management and tenure system based on fewer and larger plots of land with private title deeds. Occupation will become more dependent on off-farm activities. Agriculture still remains the most important livelihood strategy and is still based on a combination of agriculture and livestock keeping. However, due to increased urbanization, sedentarization and a growing demand for meat, the mobility of livestock will be reduced and the management of livestock will shift towards more sedentary animal husbandry rather than pastoralism.

The land use in the drylands will become mixed, where some areas, due to the decreasing population, will be abandoned or sparsely used. This may in some cases result in the transformation of previously open pastures into forested and semi-forested areas home to a growing population of wildlife. In other cases, the lack of land management will lead to land degradation and spread of invasive plants. In arable areas, agriculture and livestock practices will be intensified due to the increased demand of crop, dairy and meat products. The more stable climate conditions, in combination with the increased demand in farm produce, will enable farmers to invest in land improvements, well managed pastures, improved livestock breeds and agricultural diversification, that will materialize into emerging agropastoral markets such as a commercial honey market.

To avoid land degradation and to ensure the sustainability and enable the full utilization of drylands under this scenario, it was concluded that more research is needed regarding sustainable intensification of livestock and agricultural management in drylands. Also, increased knowledge on sustainable and efficient livestock breeding, feeding and pest management is needed, as well as a need for research related to a diversification and suitability of crops for dryland agriculture, including fruits and cash crops. In addition, research is needed on the commodification of indigenous plants and animals, as well as on the



Preparation of crude honey before shipment to Nairobi (Photo: E. Röhss)

commercial potential of new and underutilized products such as honey. For the future viability of agropastoral systems, it is crucial to pursue research on the management, control and utilization of invasive species, improved soil and water conservation, and sustainable mining practices due to newly found mineral depositions in the county.

3.3. Same, same, but worse

In this scenario, the global efforts to combat climate change have been unsuccessful and the drylands of West Pokot are experiencing an unpredictable climate with more frequent and more severe droughts and erratic rainfall. The population growth will remain high for West Pokot County and is not counteracted by growing urbanization. The population living in, and depending on the drylands of West Pokot, will therefore increase continuously.

The increased climate variability will make it difficult to predict when the drylands will receive rainfall and when they will be exposed to severe droughts or floods. This will increase the vulnerability of the agricultural sector in West Pokot, and the output of agricultural production will vary from area to area and from year to year, depending on when, where and how much it rains. Water scarcity will be severe, and distribution conflicts between household, farming and livestock keeping interests will be common phenomena.

Some farmers will not be able to cope with the changes and will become marginalized. The growing population pressure and the marginalization of some farmers will push people to engage in land encroachment and unsustainable farming practices, such as slope-land farming, resulting in habitat loss, soil erosion and loss in land fertility. The growing land pressure will also result in more land sub-division, smaller farms and less profitability. The increasing land sub-division will make livestock keeping less adaptive with increased drought and flood vulnerability of livestock herds as a result.

To avoid land degradation and to ensure the sustainability of drylands under this scenario, it was concluded that more research is needed regarding climate smart and climate resilient agricultural practices. Research on sustainable land management and intensified dryland agriculture under changing climate conditions need to be facilitated. Increased knowledge on land rehabilitation and sustainable slope-land agriculture is needed, and knowledge on crop, feed and livestock breeds hardy to drylands and climate variability needs to be improved and disseminated to practitioners.



Presentation of dryland scenarios (Photo: E. Röhss)

There is a need to improve both the knowledge and the institutional capacity for conflict management regarding natural resource and access conflicts, as well as conflicts related to growing economic and gender inequalities. The West Pokot County's resilience needs to be developed on a number of scales, such as establishment of farmer and herder support organizations, and implementation of farm and livestock insurance. A county land management vision needs to be developed, guiding the residents of West Pokot County to sustainably manage their land, harvest and store water, and to ensure the county's food security and self-sufficiency. The institutional capacity to predict, inform, mitigate and adapt to environmental hazards needs to be developed.

3.4 The crowded market

In this scenario, global efforts to combat climate change have been more successful and the climate in the drylands of West Pokot is basically the same as today's climate. The population growth will remain high for West Pokot County, and the more stable climate will motivate a high percentage of the rural population to remain in the drylands and develop their land, although a considerable number of people will still move to Kapenguria and other cities in search for jobs. Both the rural population of West Pokot County's drylands and the urban population in Kapenguria and other cities will therefore increase rapidly.

The rapid population increase leads to a number of challenges including increased land pressure and water scarcity, problems with food security, strained access to social services

and education and diminishing land sizes through land sub-division. The increased land pressure will lead to encroachment on water towers and other commons, leading to deforestation and reduced areas open for communal uses. The increased land pressure will also lead to farming on unsuitable land, livestock overgrazing, decreased livestock mobility and smaller herd sizes, soil erosion and an increased land degradation.

With the increased population, the number of land and resource conflicts will rise in the West Pokot drylands. There will be intra-family conflicts related to the inheritance of land, intra-community conflicts related to land boundaries and resource use, inter-community conflicts between the Pokot people and neighboring communities, related to resource use and livestock rustling, and there may be community-government conflicts related to encroachment on government land, such as the Nasolot game reserve, resulting in human-wildlife conflicts.

The increased population may lead to positive economic development in terms of increased availability of labor, increased internal demands and the expansion of local markets for agriculture, livestock and other products. This leads to growing investments in the West Pokot economy and opportunities to develop value chains of existing agricultural and livestock production, and to develop markets for underutilized resources.

To avoid land degradation and to ensure the sustainability and enable the full utilization of drylands under this scenario, it was concluded that more research is needed on improving agricultural practices, nutrition management and reducing land degradation. Knowledge is needed on how to ensure sustainable intensification of both the agriculture and livestock sector in terms of improved livestock breeds and crops specialized for the West Pokot climate, such as improved sorghum and millet varieties. With the increasing population, there is also an urgent need to improve value chain addition to the local agriculture, fodder and livestock production, through research but also by improving the dissemination of existing research and knowledge. There is a general need to increase the dissemination of research and best practices for agriculture and livestock production, such as improved breeding, zero grazing, intensive dairy and meat production and water harvesting to farmers and herders.

4. WORKSHOP CONCLUSIONS

Agriculture is the backbone of the West Pokot economy and is based on a combination of mixed farming systems, agropastoralism and subsistence farming with low productivity. Agriculture, livestock and other land use practices are in the four dryland scenarios exposed to changing conditions in terms of population development and climate change. Although the trajectory and effects of population development and climate change greatly differ between the scenarios, the consequences of these effects show much resemblance. All but one scenario envisions an increased pressure on land in the future, due to either increased land demands resulting from population growth, a decreased availability of fertile land resulting from increased climate variability, or to a combination of both. Similar for all scenarios is that increased land pressure may result in negative environmental and socio-economic effects such as land degradation, encroachment, resource scarcity, conflicts and marginalization. Although different in nature, consequences of decreased land pressure, experienced in the "Rural-urban push-pull" scenario, show many similarities to those of increased land pressure.

The scenarios portray contrasting developments. However, many of the research and policy needs are similar. They may differ in their details, but the general field of research and the need for policy development is similar for several scenarios. This shows that much of the future research and policy needs are embedded in the development of dryland agriculture and livestock keeping per se, and not to specific scenarios. The future development of the agriculture sector in West Pokot will depend on a combination of availability of knowledge and the design and implementation of policies and regulations. Based on the discussions during the development of the scenarios, four critical research and policy areas in need of consideration to enable the sustainable development of drylands in West Pokot County were therefore identified: 1) Land restoration and improved natural resource management capacity, 2) Productive and sustainable agriculture and livestock production and market development, 3) Conflict manage, security and equality, 4) Dissemination, implementation and education of knowledge technology and policies.

The four research and policy areas are presented in more detail and summarized below in Sections 4.1 – 4.4.

4.1. Land restoration and improved resource- and agricultural management

Land degradation, water scarcity and management have historically been major issues in West Pokot County and are critical challenges in all scenarios for the future of the agricultural sector in West Pokot. Important research and policy areas are:

Water management

- Research/knowledge needs: Water harvesting and storage techniques, irrigation techniques adapted to local conditions, alternative water sources, improved water use efficiency.
- Policy needs: Developed and improved water infrastructure e.g. irrigation, boreholes, dams, storage and harvest capacity. Implementation of a water use policy.

Livestock management

- Research/knowledge needs: Spread and effect of livestock diseases, livestock migration and cross-border management.
- Policy needs: Institutions for disease monitoring and mitigation, monitoring of livestock movement.

Land management

- Research/knowledge needs: Agroforestry techniques, climate change adaptation, land rehabilitation and reclamation, biodiversity assessments, sustainable use and farming techniques for sensible areas e.g. slope-land, terrace building.
- Policy needs: Implementation of land use policies, protection and conservation of vulnerable areas.

Invasive species

- Research/knowledge needs: Spread, use, and mitigation of invasive plants/animals.
- Policy needs: Implementation of animal and plant pest control, and controlled introduction of new species.

Soil conservation

- Research/knowledge needs: Improved soil fertility techniques, biophysical assessments, carbon and water stock, fungi and microbiological composition, nutrition value, conservation and dryland management techniques e.g. enclosures.
- Policy needs: Implementation of soil conservation management techniques.

4.2. Productive and sustainable agricultural and livestock production, and market development

Intensification, market development and value chain addition in agriculture and livestock production are critical issues to enable full the utilization of opportunities and mitigation of the challenges in all future dryland scenarios. Enablement of local value addition, resource development, successful agribusiness entrepreneurs and trade at local, national and global markets are all important for the development of economic resilience in the West Pokot County. Important research and policy areas are:

Crop and development

- Research/knowledge needs: Alternative crops, new uses for existing crops and indigenous crops, improved fodder variants, development of sustainable and hardy crops adapted to the West Pokot context, further research on hardy crops such as sorghum and millet.

Livestock development

- Research/knowledge needs: Alternative livestock species hardy to the changing environmental conditions in the West Pokot County, utilization of camels, improved breeding variants and improved techniques.
- Policy needs: Improved institutions for livestock breeding and seed distribution.

Diversification and new production systems

- Research/knowledge needs: Crop and livestock diversification, mixed crop/livestock systems, zero grazing, enclosures, poultry rearing, crop rotation and fodder harvesting.



30 years ago, cattle in Pserum were thin and unhealthy. Enclosure establishment started around that time, and have continued ever since. Nowadays there is a saying at the cattle market in Chepareria; “the fattest bulls come from Pserum” (Photo: G. Nyberg)

Intensification

- Research/knowledge needs: Irrigation systems, increased productivity, new species, water harvesting, shorter growing season and climate adapted agriculture.

Markets

- Research/knowledge needs: Market development of local products such as honey and milk, commercialization of underutilized resources, incorporation of traditional resources in the modern economy, tourism.

- Policy needs: Institutional arrangements and policies that enable the development of new and old markets.

Scales

- Research/knowledge needs: Productivity of small and large scale farming and livestock production, development of local, national and global markets.

Value chain development

- Research/knowledge needs: How to improve the value chain of local agriculture and livestock products from seed/species to end product.
- Policy needs: Institutions for localized value chain addition.

Energy

- Research/knowledge needs: Cheap renewable energy, firewood and energy crops and utilization of energy in agriculture and livestock production.
- Policy needs: Development of energy infrastructure.

Agribusiness

- Policy needs: Policies that fully legitimize pastoralism and agropastoralism and incorporate them into the modern Kenyan economy, livestock as collateral.

4.3. Conflict management, security and equality

Increased climate variability and population growth increases the stress in the social and environmental systems in West Pokot County under most scenarios. The increased stress leads to resource scarcity, conflicts and marginalization that tend to affect already marginalized groups in society more. Important research and policy areas are:

Land tenure

- Policy needs: Improved tenure security, tenure used as collateral, sensitivity to local needs and traditions and the implementation of existing tenure laws.

Equality

- Research/knowledge needs: General gender and economic equality and in relation to agriculture, empowerment of women and marginalized groups.
- Policy needs: Gender laws, West Pokot County gender and empowerment strategy, implementation of all aspects of the 2010 constitution of Kenya.

Conflict management

- Research/knowledge needs: Gender conflicts, land use conflict, resource conflicts, conflicts between neighboring communities, human-wildlife-environmental conflicts, local-government conflicts, conflict resolution.
- Policy needs: Institutions for conflict resolution and mitigation, further development of institutions and forums discussing livestock rustling, implementation of all aspects of the 2010 constitution of Kenya.

Social and economic security

- Research/knowledge needs: Effects of migration and urbanization, changes in the labor market, social security systems.
- Policy needs: Development of social security systems, livestock insurance system and formalization of traditional insurance systems.

Resilience

- Research/knowledge needs: Ecological, social and economic resilience.
- Policy needs: Development of local user organizations, national system for disaster relief and mitigation for areas exposed to climate change.

Disaster management

- Research/knowledge needs: Early warning systems, mitigation, prediction and adaptation, traditional knowledge.
- Policy needs: Implementation of early warning systems, formalization of traditional knowledge, dissemination of information, disaster relief systems, development of a general institutional resilience.

4.4. Dissemination, implementation and education of knowledge, technology and policies

A crucial component of the future development of agriculture and livestock in West Pokot is the dissemination of research findings, education of local practitioners and other stakeholders as well as a successful implementation of policies and institutions. Important policy areas are:

Education and Implementation

- Policy needs: Flexible education policy adjusted to the needs of migrating communities, e.g. mobile schools. Implementation of the latest research findings in education.

Devolution

- Policy needs: Implementation of the 2010 constitution of Kenya. Review and enforcement of existing policies and laws, including: land policy, water policy, gender policy etc.

Extension and dissemination

- Policy needs: Development of the dissemination of research and education capacity by increasing the number of agricultural and livestock extension workers with expertise on the West Pokot dryland context. Research findings should be available at local libraries. Agricultural strategies, methods and techniques need to be founded on research. Further development of the cooperation between researchers, practitioners and authorities.

5. SUMMARY AND PRIORITIZATION

As a summary and prioritization of the scenario discussions, each workshop participant was asked to place one mark for the three research/knowledge needs and the three policy needs they believe are the most important/relevant/interesting to focus on for the future, from a list of research and policy issues generated during the workshop discussions and presentations (Box 5). “Climate smart agriculture”, admittedly a wide research field, ranked as the most important research issue, “Livestock management” and “Water security and management” ranked second respective third and “Marketing and value addition” was prioritized as the fourth most important research/knowledge need. For the policy needs, “Land use policy” was considered the most important one, followed by “Water use and management policy” and “Institutions for economic resilience” as second and third and “Extension and dissemination” prioritized as fourth.

Box 5. Prioritization of research/knowledge and policy needs during the scenario discussions

Research/knowledge needs		Policy needs	
Climate smart agriculture	20	Land use policy	18
Livestock management	14	Water use and management policy	11
Water security and management	13	Institutions for economic resilience	10
Marketing and value addition	9	Extension and dissemination	9
Soil conservation management	8	Disaster management	4
Biodiversity assessment	5	Devolution policies	4
Gender and inequality	4	Gender policies	4
Energy	4	Local self-sufficiency and resilience	4
Conflict management	4	Land planning policy review	4
Animal disease management	3	Family planning services	4
Intensification	2	Social and livestock insurance	3
Agroforestry and rehabilitation	2	Agribusiness	3
Sustainable engineering	2	Education and educators	2
Crop and fruit development	1	Urban housing	1
Mining and oil	1	Enforcement of existing policy and law	1
Sustainable construction	1	Coordination	0
		Anti-corruption law	0

6. VOICES FROM THE TRIPLE-L WORKSHOP

The following section presents some of the participants' views regarding experience gained and lessons learned during the workshop as well as their thoughts of the future ahead for dryland research, management and the work of the Triple-L research initiative.

Dereje Wakjira – IGAD

The Triple-L scenario workshop is an effective instrument to facilitate discussions between members of the research community, NGOs, IGOs, local authorities and practitioners. Triple-L play a critical role in bridging the gap between researchers' and practitioners' knowledge needs, by identifying relevant research fields and engaging in applied research. The experience from the workshop should result in an even more holistic research in the future, where researcher from different academic disciplines work together to bridge the knowledge gaps needed to ensure the resilience of the dryland system. Research is needed on biophysical and social effects of individual enclosures, but also on the effect of enclosures on social and environmental resilience at a landscape scale. This, since it is unattainable for all resident of the West Pokot County to establish enclosures. This is where the future work of the Triple-L research initiative needs to be focused according to Mr. Wakjira.

Evelyn Koskei - West Pokot County Director of Agriculture

The Triple-L scenario workshop has acted as a dryland stakeholder forum where scientists, local authorities and members from different organizations come together to address the issue of sustainable dryland management, and where we can share our different experience and knowledge. The workshop enabled local practitioners to share their knowledge of the local conditions in West Pokot County and, together with scientists develop new and relevant research topics for applied research. These scenarios will assist the West Pokot County administration on how to work with the development of the agriculture sector and how to mitigate the growing problem of climate change. The research should however not only focus on the West Pokot County but should expand to include other dryland counties in Kenya for comparison. This is where the future work of the Triple-L research initiative needs to be focused according to Madam Koskei.



Madam Koskei share her workshop reflections (Photo: E. Röhss)

Benjamin Lokorwa - Triple-L (field officer at Vi Agroforestry)

The dryland scenario workshop helps to increase the awareness of sustainable dryland management and the effects of the establishment of enclosures in the West Pokot County. By bringing together researchers, local authorities and practitioners, the dissemination of existing knowledge improves and the appreciation of the research and policy needs increases both among researchers and authorities, enabling all stakeholders of the West Pokot drylands to speak with one voice.

Lonah Mukoya - Vi Agroforestry

The research of Triple-L build on the work achieved by the Vi Agroforestry in the West Pokot County. Although a lot of research have been conducted at this point, the workshop has enabled us to identify new research and policy gaps needed to be addressed both by the research community, Vi Agroforestry and the local authorities. It is very important for the future of the West Pokot drylands that this research is continued and that the findings are implemented by local practitioners, with the help of Triple-L and Vi agroforestry.

Concluding comments from the conveners Gert Nyberg and Per Knutsson

This scenario workshop proved to be very useful in identifying future research needs. Discussions between scientists from different disciplines as well as practitioners and policy makers rendered both width and detail to discussions that is not often encountered when only discussing within one group of people. The openness and eagerness to participate in discussions was truly impressive. We hope that local famers, officials and other stakeholders found the workshop as useful and rewarding as we did. Hopefully they will be able to use some insights and ideas from the workshop in their future development of policies and practices for West Pokot County. We will for sure use the identified key research issues in our coming work on developing new research applications. We are deeply grateful to all participants for making this workshop so rewarding. Although the results and outcomes of this scenario workshop are important, the discussions and process during the workshop was even more important. And; it was a lot of fun.

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Participants of the Triple-L Dryland Scenario Workshop 29-30th of November 2016 (Photo: E. Röhss)

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