



Regional Learning &
Advocacy Programme
for Vulnerable Dryland
Communities



The place of crop agriculture for resilience building in the drylands of the Horn of Africa: an opportunity or a threat?



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ACRONYMS AND ABBREVIATIONS

ASALs	Arid and semi-arid lands
AU	African Union
CA	Conservation agriculture
CAADP	Comprehensive African Agriculture Development Programme
CCA	Climate change adaptation
CGIAR	Consultative Group on International Agricultural Research
CMDRR	Community managed disaster risk reduction
COMESA	Common Market for Eastern and Southern Africa
DRR	Disaster Risk Reduction
EAC	East African Community
ECHO	European Commission Humanitarian Aid and Civil Protection Department
EDE	Ending Drought Emergencies
EMG	Environment Management Group of the UN
ESW	Early Warning System
FAO	Food and Agriculture Organization of the UN
GDP	Gross domestic product
IDDRSI	IGAD Drought Disaster and Sustainability Initiative
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IGAD	Inter-Governmental Authority on Development
IIED	International Institute for Environment and Development
ILRI	International Livestock Research Institute
IMAWESA	Improved Management in Eastern and Southern Africa
IPCC	Inter-Governmental Panel on Climate Change
IRAM	Institute of Research and Application of Development Methods
IUCN	International Union for the Conservation of Nature (World Conservation Union)
MDG	Millennium Development Goal
MTEP	Mid-Term Expenditure Plan
NFTP	Non-timber forest product
NGO	Non-Governmental Organization
PCDP	Pastoral Communities Development Project
PES	Payment for environmental services
PPP	Public-private partnership
REGLAP	Regional Learning and Advocacy Programme for Vulnerable Dryland Communities
SLM	Sustainable land management
SSI	Small-scale irrigation
SWOC	Strengths, Weaknesses, Opportunities and Constraints
TLU	Tropical livestock unit
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	US Aid

Executive Summary

The study aims to inform, through an overview of literature and experience, government, NGOs, private sector partners and REGLAP on the evidence base for policy and practice on development in pastoral regions of the Horn of Africa, with particular reference to small-scale irrigation. The 'pastoralist's dilemma', whereby the amount of rangeland that is available is considered to be insufficient to support enough livestock to provide livelihoods for a fast growing population, is being exacerbated by the loss of rangeland (especially valuable riverine pastures) to appropriations for commercial farming and especially irrigated plantations. Many severe droughts have caused high mortality and the intervals between them have not permitted herd reconstitution. There are increasing numbers of destitute pastoralists with few or no surviving livestock.

This is a complex system dynamic containing many elements. Singled out amongst environmental variables are scarcity and variability of rainfall and water resources, which are at the root of uncertainty experienced by human communities, themselves growing rapidly in numbers (with accompanying migration and urbanization). Far-reaching land use change reflects unprecedented pressures on the land from livestock, farmers, corporations and governments, transforming ecosystems and driving degradation in many areas. However, urbanization and international trade are encouraging increasing participation in markets: those for inputs, outputs, land and labour, resulting in the diversification of household livelihoods. Consequently the investment landscape is changing rapidly as dryland resources are revalued upwards and external actors increase their involvement. The dynamics of the human and biological systems thus pose a threat but also offer opportunities, one of which is irrigation for the markets.

The droughts of the past decade have helped to focus policy directions in the region, both at the international level and in national policy making. In general there is some movement towards a coherent policy towards pastoralism that recognizes the value of the systems rather than seeking to replace them. This is apparent in the African Union's *Policy Framework for Pastoralism in Africa* and COMESA's *Policy Framework for Food Security in Pastoral Areas* under Pillar III of the CAADP. IGAD's *Drought Disaster and Sustainability Initiative* supported *Country Planning Papers* for Ethiopia, Uganda and Kenya. These statements, which each sit within an existing structure of national policies and institutions relating to the agricultural and water sectors, climate and food security programmes, vary in tone from more centralised (Ethiopia) to decentralised (Kenya). Kenya has recently enacted its *National Policy for the Sustainable Development of Northern Kenya and other Arid Lands*. Development is the ultimate answer to poverty and hunger in the drylands, but many issues of local ownership, participation and empowerment remain to be addressed.

Three policy pathways are available to governments and development agencies in the drylands of the Horn of Africa:

1. Promotion of crop agriculture, especially small-scale irrigation;
2. Continued support for pastoralism, albeit in new forms; and
3. Facilitating income diversification (including migration).

An analysis of the strengths, weaknesses, opportunities and constraints of these options is offered. The first (which is the main focus of this study) offers increased value per ha under irrigation. Ex-pastoralists take up irrigation, retaining secondary livestock interests. These agro-

pastoral systems reap the advantages of diversification and a reduced risk of food insecurity. However, constrained by few animals, small holdings and shortages of capital, they may have exchanged one poverty trap only to enter another in the longer term. Much irrigable land remains. However irrigation needs considerable investment including inputs, technologies, services and markets. Expansion, though certain to occur (spontaneously even if not promoted by policy), will need investment and adaptation. The situation varies from country to country. Technologies are available, models for investment and cost recovery have been tried, and attention given to agro-pastoral transitions. Ethiopia prioritizes large-scale schemes, whereas Kenya has favoured decentralized solutions, with public-private partnerships and other innovative financial approaches. There is urgent need for more data and for economic studies of comparative advantage, cost effectiveness and mitigating the potential negative social and environmental consequences of these attempts.

The second option is justified by the importance of the livestock sector in national economies, by evidence of its efficiency given the environmental conditions of the ASALs, and by the size of the populations it supports. This does not mean that existing systems cannot be improved, or restored to greater productivity. Increasing economic differentiation reflects the scope for 'modernization'.

The third option (livelihood diversification) offers risk reduction, a safety net for poor households, and a route to employment outside the agricultural sector, especially when access is improved through education. It is happening anyway and policy should aim to facilitate rather than ignore it. Urbanization and the growth of markets both create demand for livestock products and crops and employ ex-pastoralists (or their children, when educated).

Thus a mix of all three options offers the best course for governments and for households that wish to reduce their dependency on mobile pastoralism. The need to promote education is clear but with the proviso that growth in labour markets is also necessary.

Policies for dryland livelihoods should therefore seek to integrate mobile and agro-pastoralism with small-scale irrigation and livelihood diversification, and interventions should take account of the dynamics of the multi-sectoral, human-ecological systems. Continuation of pastoralism in some form is too important to be made a hostage to fortune either through neglect or by forcing a transition to untried model. Whatever the 'pros' and 'cons' of crop farming (rain-fed, irrigated, large or small-scale), the drivers of irrigated farming (macro-economic policy at the large scale and market-driven autonomous small-scale initiatives) are already established features of the economic landscape and cannot be ignored or reversed. Notwithstanding a paucity of quantified empirical evidence, urbanization and growing markets are driving livelihood strategies into income diversification through informal sector employment or trading, or by means of education, on which there is evidence of rising autonomous demand, and positive experience elsewhere in the world. Given the global trend in favour of more democratic and open governance, and a (hoped for) convergence of policy objectives with the livelihood expectations of poor people (seen as solutions rather than as problems), all interest can now work with the same frame of reference, throughout the spectrum of development and drought risk reduction.

It is suggested that we may be on the cusp of a significant transition to growth in the small-scale irrigated sector. Enabling a transition will be the challenge for the promotion of good practice and for innovative research. Good practice in small-scale irrigation should include (1) planning that recognizes system interactions, reconciles contested claims to resources, and follows democratic

principles; (2) freedom of choice in matters relating to household livelihood strategies; (3) recognizing and realizing the complementary benefits of livestock; (4) the conservation of soils and water; (5) educational enablement of individual life chances; fully participatory irrigation development and regulation; (6) allowance for multi-sectoral livelihood strategies; (7) exploitation of complementarities between production systems at the local level; (8) enhancing of livelihoods and better life chances for individuals through education; (9) extension as a way of building human capital; (10) action research and innovation relevant to small-scale production units; and (11) provision of economic incentives for micro-investments. A framework for action is proposed with technical, economic / financial, and policy/ institutional agendas.

Irrigation technologies are known; research should concentrate on enablement and capacity issues, including: (1) integrated development pathways, including that of development with emergency response; (2) acquisition of more and better data on natural resource systems and their exploitation; (3) economics of small-scale irrigation, its management and comparative advantage; (4) trade-offs between development options, at all levels; (5) natural resource governance and institutions, especially issues of tenure security, and (6) new models of demand-led research, participatory project design and execution, private investment and long-term farmer-led monitoring.

1. Introduction

Pastoralism in the Horn of Africa is currently experiencing intensifying pressures resulting from human and herd demographics, environmental change, contested natural resources, livelihood impoverishment and political marginalization. Some of these changes may threaten the very future of pastoralism in modern economies, at least for the poor. On the other hand, new adaptive responses to the challenges facing pastoralists are taking place, particularly with respect to markets. Furthermore, mobile pastoralism is an efficient system of natural resource management in the arid grasslands. How should governments and civil society (including donors and the voluntary sector) respond to the bad and the good news? They face priority choices that involve major trade-offs between economic activities. Amongst these constantly shifting and competing choices, and especially relevant to organizations seeking to intervene through poverty-reducing projects, is a strategy to promote crop farming, and small-scale irrigation in particular. This may offer a form of productive diversification for pastoral peoples, especially those who find that their livestock-based production system is no longer viable.

The Oxfam-led Regional Learning and Advocacy Project (REGLAP) is a consortium project that aims to promote resilience among vulnerable dryland communities in Uganda, Ethiopia and Kenya through policy change and practice. The project is currently funded by the European Commission's Humanitarian Office's Drought Risk Reduction Action Plan (DRRAP). REGLAP has been in existence since 2008, funded by ECHO, first as the Regional Pastoral Livelihood Program, to strengthen the evidence base for support for pastoral populations, and later as the Regional Learning and Advocacy program for vulnerable dryland communities.

This study, commissioned by REGLAP, aimed to review available evidence concerning the potential for expansion of crop agriculture, as an alternative or complementary strategy to pastoralism, in arid and semi arid areas of Kenya, Ethiopia and Uganda (large and small scale irrigated and rain fed), in order to promote sustainable and resilient livelihoods. These were to be weighed against other livelihoods support options in order to inform REGLAP's own advocacy position as well as those of Oxfam and other NGOs, especially around the IGAD-led Ending Drought Emergency (EDE) plans. Research gaps and means of filling them were to be suggested. Recommendations for advocacy and practice in promoting crop agriculture in relation to other investment priorities would be made.

This exercise is neither a comprehensive review of dryland agriculture nor a feasibility study for interventions. The first would require prolonged immersion in a large literature carried out within the region and its constituent countries¹. The second calls for technical and economic data which is largely missing from published literature and should be undertaken on a site-specific basis, though learning from previous experience.²

Emphasis in this document is placed instead on a comparative analysis of available options for policy makers and development agencies, and seeking to locate the transition of pastoral production systems within a broad developmental framework. This means taking account of both

¹ The Present exercise is limited to Kenya, Ethiopia and Uganda but it is hoped that the argument and findings will be found relevant to all the drylands in the Greater Horn of Africa.

² An agricultural scientist resident in Kenya and with access to the mostly 'grey' literature had to withdraw from the study and could not be replaced within the time available.

the interconnections and the dynamics of livelihood systems. At this point in time, as the limitations of humanitarian responses to drought and the need for longer-term resilience are increasingly clear, there is impetus for a well-informed debate on the appropriateness of crop agriculture for facilitating a transition of pastoral production systems, that helps those (the majority) for whom there may be no going back.

Following this Introduction, Sections 2 - 5 are as follows:

2. *Situation analysis: capturing the dynamic.* The interactions between pastoralists and their environment (natural and human systems) are reviewed in terms of six themes of uncertainty: rainfall variability, variability of water resources, demographic change, land use change, markets, and investment. (Readers familiar with this background may wish to go directly to Section 3.)

3. *The policy context.* Statements of the African Union (AU), Common Market of Eastern and Southern Africa (COMESA), IGAD, and key policy documents for Ethiopia, Uganda and Kenya are summarized, to point up areas of convergence in policy related to arid and semi-arid lands (ASALs).

4. *Pathways and options.* An analysis in terms of three major developmental options (continuing support to pastoralism; crop agriculture (specifically irrigation); and livelihood diversification) is carried out using SWOC (strengths, weaknesses, opportunities and constraints). The policy choices are set in a system-wide context.

5. *Selecting a strategy.* Narrowing the focus to crop agriculture, specifically irrigation by smallholders, the findings are presented in terms of: principles, findings ('assertions') and good practice.

2. Situation Analysis - capturing the dynamic

The human and natural interactions that characterize the dryland system are complex and have too often been ignored in sector-based interventions.³ The objective of this review is to set the context of development interventions in natural resource management and livelihood improvement. This context can be characterized in the simplest terms as *uncertainty* and *change*. Mobile pastoralism - as well as farming and agro-pastoralism in arid and semi-arid lands (ASALs) - is adapted to environmental uncertainty in the short, medium and long term. Moreover - for reasons that are both local and global - social, political and economic drivers also inject uncertainty into human and ecological systems. Complex interactions between these systems (pastoralists, farmers, their environment, external drivers of change, and development efforts) are intrinsic to drylands.⁴

Six dimensions of uncertainty and change are reviewed below. They provide a platform for the country reviews of dryland policy in Section 3. The selection is not exclusive:

- 2.1 Variability of rainfall
- 2.2 Variability of water resources
- 2.3 Demographic change
- 2.4 Changing land use
- 2.5 Markets and livelihoods
- 2.6 Investment

2.1 Variability of rainfall

Rainfall variability is the root cause of uncertainty in dryland environments, in Eastern Africa as in tropical and sub-tropical drylands everywhere. Including extremes of drought or flooding, variability has characterized ecosystems on geological, historical, generational, annual and seasonal time-scales. Agricultural drought has a major impact on both food security at the household level and GDP at the national level, intensifying chronic scarcity in Ethiopia.⁵ In Eastern Kenya, failure of the long and short rains in 2010 and 2011 resulted in a loss of 50-60% of crop yields in less dry and 80-90% in drier areas⁶ In the Afar region of Ethiopia, the impact of recent droughts has been to reduce average livestock holdings *per capita* from 10 to 4 TLUs (tropical livestock units).⁷

Controversy surrounds the question of whether variability has recently increased, affecting the scale, frequency or intensity of disasters. Impact indicators, on natural ecosystems or human systems, are affected by increases in the vulnerable human populations, and by difficulties of attribution, as many drivers other than climatic can increase the social impact of climatic extremes. Climate change adaptation (CCA) and disaster risk reduction (DRR) have attracted much

³ Flintan, F. (2013) Plotting Progress: Integrated Planning in the Drylands of Kenya, Ethiopia and Uganda. REGLAP

⁴ Reynolds, J., Stafford Smith, M., et al. (2007) 'Global desertification: building a science for dryland development' Science, 316, 11 May, 2007: 847-851 with supporting online material.

⁵ Evans, E. (2012) Resources, risk and resilience: scarcity and climate change in Ethiopia. Centre on International Cooperation, New York University

⁶ Recha, J., Kinyangi, J. & Mondli, H. (2012) Climate related risks and opportunities for agricultural adaptation in semi-arid eastern Kenya. CGIAR and CCAFS Research Program on Climate Change, Agriculture and Food Security

⁷ Davies, J. (2006) 'Capitalization, commoditization and obligation among Ethiopia's Afar pastoralists', Nomadic Peoples, 10/1: 29-52

scientific attention. But the contrasting effects of global drivers and their complexity challenge projections of their consequences for dryland ecosystems.⁸

If the predictions of the IPCC⁹ are accepted, long-term changes in climate in the drylands will become manifest in increasing frequency and intensity of extremes, and of droughts in particular. However, the oft-repeated assumption that drier conditions will affect all drylands does not match with the IPCC's own projections. Average change in precipitation was compared between the two periods 1980-99 and 2080-99. Of 21 simulations (General Circulation Models, or GCMs) applied to the Horn and East Africa, a majority predicted no change in average rainfall in the months June - August, and 66-90 percent predicted increased precipitation in the months December - February (*ibid.*, Chapter 11, p.859).¹⁰ Historic data for Ethiopian (Somali Region) rainfall shows no significant change during the period 2000 - 2006, though subjective observations claimed a shortening of the rainy seasons.¹¹ A recent study demonstrates how annual rainfall has increased in northern Kenya since the 1920s.¹² Kenya's rainfall records show evidence of cyclical patterns.¹³

Mean annual rainfall is not the only climatic variable which is susceptible to trends. Work carried out at the International Livestock Research Institute (ILRI) predicts a significant shortening of the growing season between 2000 and 2020, especially along the arid margins in sub-Saharan Africa.¹⁴ An alternative study shows significant negative trends in the northern Sahel and the short rains in western Kenya, but positive trends in western Africa and the long rains of western Kenya.¹⁵

In Eastern Africa, many climate regimes are bimodal (having two weakly linked seasons of rainfall), which has a double effect: increasing the severity of the regime, in which each season provides a half or less of an already meagre annual rainfall, but allowing a second chance of cropping or pasture growth within a twelve month cycle. Upward temperature changes may affect biological productivity around the east African highlands. Warming of grasslands - often assumed to have desiccating effects - may be cancelled by increased CO₂ sequestration.¹⁶

To be forewarned is to be forearmed. But global predictions that food production in developing countries will fall by 9-11 percent by 2070 (Parry et al., 2009) are only as reliable as the models

⁸ Maestre, F., Sakguero-Gomez & Quero, J.L. (2012), It is getting hotter in here: determining and projecting the impacts of global environmental change on drylands. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 367/1606: 3062-3075.

⁹ Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K.B., Tignor, M. & Miller, H. (eds.) (2007), *Climate Change 2007. The Physical Science Basis*. Cambridge University Press, Chapter 11.

¹⁰ *Ibid*, p.859

¹¹ Devereux, S. (2006), *Vulnerable livelihoods in Somali Region, Ethiopia*. IDS Research Report 57, Institute of Development Studies at the University of Sussex; Abdurehman Eid (2012), *Review of literature on pastoralism and agro-pastoralism in Somali Region of Ethiopia*. Lessons learnt in water development, Pastoral Technical Working Group, Somali Regional State of Ethiopia

¹² Avery, S.T. (2012), *Lake Turkana and the lower Omo: hydrological impacts of major dams and irrigation developments*. Vol. 1: Report. African Studies Centre, University of Oxford.

¹³ Tiffen, M., Mortimore, M. & Gichuki, F. (1994), *More people, less erosion: environmental recovery in Kenya*. Chichester: John Wiley, 35

¹⁴ Thornton P.K., Kruska R.L., Henninger N., Kristjanson P.M., Reid R.S., Atieno F., Odero A.N. & Ndegwa T. (2002), *Mapping poverty and livestock in the developing world*. Nairobi: International Livestock Research Institute

¹⁵ Vrieling, A., de Leeuw, J., Said, M., & Ericksen, P. (2012), Length of growing period over Africa: variability and trends from 30 years of NDVI time series. *Remote Sensing* 2012, 4, 1-x

¹⁶ EMG (2012), *Global drylands: a UN System-wide response*. Nairobi: United Nations Environmental Management Group

and assumptions on which they are based.¹⁷ From a farming or pastoral perspective, variability (which can be managed) is more urgent than a long-term trend, which is normally perceived only in terms of memories which may be nostalgic or unreliable. Early warning systems (EWS) are specific to particular areas or regions, but the criticism of EWS is that they are often too late. Data from remotely sensed satellites perform best when grounded in farmers' or communities' knowledge and strategies.¹⁸ However this information may be costly to collect.

Much attention has recently been given to seasonal weather forecasting to support farmers' investment decisions (planting and fertilization strategies).¹⁹ As farming becomes increasingly monetized, the value of such a strategy may be expected to increase. For pastoral grazing strategies, model simulations of the impacts of climatic and spatial variability on livestock systems have been employed.²⁰ Remote sensing technology may offer a possibility of informing decisions to move herds.

Not enough attention has been given to local knowledge and adaptive strategies whereby pastoralists have sought to manage variation opportunistically. A critical element in the 'pastoralists' dilemma' is the failure of policy to recognize and support the 'water use efficiency' of mobile grazing strategies. Cultivators, too, have evolved systems of dryland farming and spate irrigation.²¹ It has become customary in expert discussion to regard local adaptive capacity as valid in the past, but inadequate to respond to the speed and magnitude of current change (climatic, demographic, or economic). Given that in both environmental change and projected future outcomes, the only certainty is uncertainty, it is wise to strengthen local adaptive capacity, building on the strengths of local knowledge and experience.

2.2 Variability of water resources

Strongly linked with the low and uncertain rainfall in pastoral areas is the hydrology of surface and underground water resources. For example: Lake Turkana has fluctuated over a range of up to 20 metres in living memory;²² seasonal streams cease to flow during the dry season when they would otherwise be useful; excavated river beds provide dirty and polluted water for domestic use when seasonal surface waters disappear; wetlands with shallow groundwater are strongly contested for grazing or for cultivation; and wells may suffer damage or run dry in drought. Consequently, perennial rivers are attractive targets for corporate appropriation of land and water resources, such as in the Awash valley,²³ the Omo,²⁴ and the Tana.²⁵

¹⁷ Parry M.,(2009), cited in EMG, *ibid*, 46-47

¹⁸ Campbell D.J. (1999), Community-based strategies for coping with food scarcity: a role in African famine early warning systems. *Human Ecology* 20/3: 231-241.

¹⁹ Cooper ,P. J. M., Dimes ,J., Rao, K.P.C., Shapiro B., Shiferaw, B. & Twomlow, S. (2008), Coping better with current climatic variability in the rain-fed farming systems of sub-Saharan Africa: an essential first step in adapting to future climate change? *Agriculture, Ecosystems & Environment* 126/1-2: 24-35

²⁰ Illius A., Derry J.F. & Gordon I.J.(1998) Evaluation of strategies for tracking climatic variation in semi-arid grazing systems, *Agricultural Systems* 63: 73-74

²¹ Spate irrigation is farming with residual flood water accumulated naturally or behind soil bunds on flat or gently sloping sites after rainfall.

²² Avery S. T., *ibid*.

²³ Behnke, R. & Kerven, C. (2013). Counting the costs: replacing pastoralism with irrigated agriculture in the Awash valley, north-eastern Ethiopia. IIED Climate Change Working Paper 4 (forthcoming)

²⁴ Avery S., *ibid*.

²⁵ Duvail, S., Medard C., Hamerlynck,O. & Nyngi, D.W.(2012), Land water grabbing in an East African coastal wetland: the case of the Tana Delta. *Water Alternatives* 5/2: 322-343

Data on river hydrology is inadequate. Very little quantitative information is easily available on groundwater, and on the seasonal behaviour of water tables. Remote sensing has been used to map irrigation water resources, showing a pattern of distribution heavily dependent on outflow from the 'water towers' of the Ethiopian Highlands and the highlands of Mount Kenya and the Aberdares. Both large- and small-scale irrigation have received major investments of public and private capital. But modeling based on mapping and on productivity assumptions has led to the conclusion that irrigation investments "appear to be capable of profitably absorbing only about 3% of the estimated pastoralist population by 2020" in the Horn of Africa.²⁶ This is based on a 'combined biophysical and socioeconomic' study of irrigation potentials in Africa.

Hydraulic infrastructure is critically important for pastoralism as well as for irrigation.²⁷ The extraction of underground water (away from rivers) for irrigation may, however, be uneconomic or unsustainable in the long term depending on the characteristics of the aquifers. The dryland habitats of mobile pastoralism rarely enjoy reliable surface water except where perennial rivers are fed from more humid uplands. The Somali Region of Ethiopia (like Somalia) benefits from such rivers. There has been substantial development through small-scale irrigation, for example in the valley of the Wabi Shabelle River.²⁸ The Lower Omo is the current target of major commercial irrigation development on lands traditionally occupied by agro-pastoral communities.²⁹

There is no shortage of proven technologies for small-scale irrigation and water management.³⁰ However, extensive irrigation infrastructure cannot or should not be constructed in isolation from other uses. Besides the needs of animals, dam construction for storage, micro-catchments and rainwater harvesting on fields, supplies of potable water for homes, schools, etc. have to be balanced with available precipitation, and perennial or underground flow at the level of the local community, where uncertainty may lead to disputes.³¹ With respect to the irrigation option, therefore, both scarcity and variability of irrigation water are major constraints in the 'pastoralists' dilemma'. Every country needs a Water Act, effective in regulating access to water and in particular, reconciling the demands of industrial users (e.g. flower growers) and large-scale irrigators with those of pastoralists, who also need land use zonation to protect their reserve pastures.³²

²⁶ You L., Ringler C., Wood-Sichra U., Robertson R., Wood S., Tingju Z., Nelson G., Guo Z., Sun Y. (2011), What is the irrigation potential for Africa? A combined biophysical and socioeconomic approach. *Food Policy* 36: 770-782 ; Headey, D., Tafesse, A.S., You & Lianqzshi (2012), Enhancing resilience in the Horn of Africa. An exploration into alternative investment options. Discussion paper 01176, IFPRI, Washington DC

²⁷ Gomes, N. (2006), Access to water, pastoral resource management and pastoralists' livelihoods. Lessons learnt from water development in selected areas of eastern Africa (Kenya, Ethiopia, Somalia). Livelihood Support Programme, FAO; Abdurehman Eid (2012), Review of literature on pastoralism and agro-pastoralism in Somali Region of Ethiopia. Lessons learnt in water development. Pastoral Technical Working Group, Somali Regional State of Ethiopia

²⁸ Agricultural Working Group (n.d.), Irrigated and rain-fed farming in Somali Regional State, Ethiopia: lessons learnt; USAID/Feinstein/Tufts (2010), Impact assessment of small-scale pump irrigation in the Somali Region of Ethiopia. PLI Policy Project

²⁹ Avery, S.T., *ibid.*

³⁰ Mati, B.M. (2005), Overview of water and soil nutrient management under smallholder rain-fed agriculture in East Africa. Working Paper 105, IWMI. (2007), 100 ways to manage water for smallholder agriculture in Eastern and Southern Africa. A compendium of technologies and practices. SWMnet Working Paper 13, IMAWESA.

³¹ Gichuki, F.N. (2000), Makueni District Profile: water management, 1989-1998. Working Paper 3, Policy requirements for farmer investment in semi-arid Africa, Drylands Research, UK.

³² Wester, D., *pers.com.*

2.3 Demographic change

In a classification of farming/livestock keeping systems, most pastoral areas in the Horn of Africa are included in the “livestock only, arid/ semi-arid tropics and subtropics” region. Some data are compiled in the table below.³³

Table 2.3.1: Country demographic data for livestock only systems, arid or semi arid tropics

<i>Country</i>	<i>Area (in '000 km2)</i>	<i>Population (in '000s) c.2005</i>	<i>Population (in '000s) c.2050</i>	<i>Population density (per km2) c.2005</i>	<i>Illustrative no. of poor livestock keepers (‘000s)</i>
Djibouti	6.3	354	777	56	118.4
Eritrea	40.5	584	1,381	14	195.2
Ethiopia	435.1	3,335	9,070	8	1,115.1
Kenya	300.0	1,099	1,963	4	350.8
Somalia	505.3	7,395	23,315	15	2,473.0
Tanzania	62.6	297	714	5	115.3
Uganda	0.2	0.3	0.5	13	0.1
Total	1,350.0	12964	37,220	10	4,367.8

Source: Thornton et al., *ibid*

With the exception of Djibouti, almost 13 million people live in the ‘livestock only’ region, occupying 1.350 million km² at average population densities of <16 per km², including an estimated 4.4 million poor livestock keepers (using the World Bank’s definition of ‘rural poverty’ at < \$1/day).

However, it is probable that greater numbers of livestock are kept in “mixed rainfed arid/ semi-arid” systems. Since it is this region that conflicts of interest between farming and livestock keeping are most likely to arise, the following table gives corresponding data for this region.

³³ Thornton et al., *ibid*

Table 2.3.2: Country demographic data for mixed rainfed systems, arid or semi-arid tropics

Country	Area (in '000 km²)	Population (in '000s) c.2005	Population (in 000s) 2050	Population density (per km²) c.2005	Illustrative no. of poor livestock keepers (‘000s)
Djibouti	6.3	0	0	0	0
Eritrea	31.3	2,416	5,739	77	722.8
Ethiopia	97.7	6,600	17,878	68	1,974.6
Kenya	90.1	4,105	6,965	46	1,172.4
Somalia	42.5	1,778	5,606	42	532.0
Tanzania	226.6	6,752	16,219	30	2,346.1
Uganda	0.1	0.9	0.9	70	0.03
Total	488.2	21,651	52,409	44	6,747.9

Source: Thornton et al., *ibid.*

Apart from the reliability of the numbers themselves, uncertainty arises from several sources. Projections, according UN median estimates to 2050, appear to produce some startling results, especially for Somalia. An expected demographic transition to lower fertility rates may lead to a decline in the rate of natural increase (dependent on economic, health and diet variables). Given the mobility of pastoral societies, and the unpredictable impact of land fragmentation, the redistribution of population through urbanization and migration are more likely than multiplication *in situ*, though there is now evidence of decline in urbanization rates in sub-Saharan Africa.³⁴

The greatest uncertainty lies in the future of livelihood systems faced with the reality of demographic change.³⁵ For example, in Turkana since 1997, the growth of the pastoral population has combined with the impact of repeated droughts on falling grazing resources to bring about a fall in the numbers of livestock (in tropical livestock units, or TLUs) from 4-5/cap to 1-2/cap. But this diminution has not affected all households equally. Only 10% of households own 60% of the cattle, while 51% have none.³⁶ Poverty reduction measures therefore must be targeted, or (as happens now), donors' investments will disproportionately benefit those who already have

³⁴ Potts, D. (2009). The slowing of sub-Saharan Africa's urbanization: evidence and implications for urban livelihoods. *Environment and Urbanization* 21(1): 253-259

³⁵ Sandford, S. (2011). Too many people, too few livestock: the crisis affecting pastoralists in the Greater Horn of Africa. A thesis. Unpublished paper, REGLAP

³⁶ De Leeuw, J., *pers.com.*

enough. Meanwhile, in Kenya 8% are estimated to be leaving mobile pastoralism every year.³⁷ This may be presumed to reflect ongoing sedentarization (which is found in most nomadic systems).³⁸

Therefore, very relevant to individuals' livelihood decisions are the levels of expected employment for urban migrants, the efficiency of information networks and transportation for short-term circulation, and the scope and possibilities for bi-local residence and income earning. Fertility at the household level is the result of a complex algorithm in which scattered livelihoods and high mobility appear to offer rewards to large families. While an observer may wish to see fewer children as a response to the supposed limits of natural resources, it is the need to escape from dependence on these same resources that confers advantage on large families.

2.4 Land use change: sustainability or degradation?

Thus, at the heart of the 'pastoralist's dilemma', as seen by many observers, is an apparent Malthusian contradiction between livestock supporting capacity (on rangeland subject to frequent droughts, supposed long-term degradation, and land-grabbing by outsiders) and a rapidly growing human population (expressed in demand for more livestock and pressure on grazing).

Uncertainty, on long, medium or shorter time-scales, characterizes land use systems in Sub-Saharan Africa. A climax is approaching as the supply of free land becomes exhausted, and vast areas of cultivable land are slowly transformed from natural ecosystems to managed agro-ecosystems. Ecosystems in humid, sub-humid and semi-arid biomes are being deforested, and turned into farmland, with shortening fallows, and eventually into permanent cultivation, with scattered, valuable and protected trees ('farmed parkland'). Natural ecosystems are becoming confined to reservations for wildlife and tourism. Outside the towns and villages, the landscape forms a mosaic, increasingly permanent, with cumulative micro-investments, and land use intensification where the scarcity of land is greatest. This relatively 'slow' process leads to the disappearance of free land.

But in low rainfall areas, where rainfed agriculture is impossible, this model does not apply. Instead, grassland, savanna and dry forest ecosystems continue to support mobile herding of livestock, whose rationale is finely adapted to short-term, seasonal, uncertainty on a 'fast' time scale.³⁹ These areas are also suited to dryland wildlife conservation.⁴⁰ These two contrasting processes exemplify the 'slow' and 'fast' variables which drive the human-environmental systems in the drylands.⁴¹

This 'big story' of two emerging landscapes, however, is incomplete. It is overlaid by three narratives which describe present day dynamics across the wide sweep of arid and semi-arid rangelands. The first focuses on the issue of sustainability under changing conditions.⁴² In drylands in particular, degradation is believed to be widespread, especially in so-called 'hot spots' of

³⁷ Allport, R., *pers.com*.

³⁸ Njoka, J. (2012) Enhancing resilience to climate change in the Horn of Africa. ReSAKSS (Regional Strategic Analysis and Knowledge Support Systems)

³⁹ Scoones, I. (ed.)(1994), *Living with uncertainty: new directions in pastoral development in Africa*. London, Intermediate Technology Publications.

⁴⁰ Avery, S.T., *ibid*.

⁴¹ Reynolds et al., *ibid*.

⁴² Njoka, J., *ibid*.; Recha, J. *et al*, *ibid*.

degradation such as Turkana and Karamoja. In cultivated areas this takes the form of declining bio-productivity driven by over-cultivation, erosion and the removal of soil nutrients. In the rangeland, there is a decline in pasture quality and quantity through pressure from increasing numbers of grazing animals.

More specifically, Maasai rangelands near Amboseli have fallen by 30% in productivity since 1967, according to monthly plot measurements.⁴³ Mobility is essential to restore restorative growth. There is a 30% gain in energy production through being mobile. Livestock must move to reserve pastures during the dry season or drought. Enclosure, e.g for irrigation - more profitable than livestock - or for group ranches, interrupts this mobility. Until the 1950s there was abundant biomass, but thereafter dams and boreholes led to a tripling of the livestock population. Droughts later decimated the herds by up to 70%.

A second overlay on pastoral landscape evolution is that of interventions, first by colonial and later by post-colonial governments, convinced that mobile pastoralism was anachronistic, inefficient, and in need of transformation. Thus in Karamoja in northern Uganda, the prohibition of burning, dams and valley water tanks, livestock disease control, and other attempts to improve and control the system have been blamed for pasture deterioration, soil erosion and disease outbreaks that indirectly provoked violence, livestock theft, and subsequent chronic instability.⁴⁴ Food insecurity is worsened by the Government's attempts to disarm combatants. These threats to sustainability are accentuated by the need for resilience in the face of repeated droughts.⁴⁵

Finally, a third narrative is that of 'fragmentation' or the progressive appropriation of land by external corporations and large-scale private farmers and stock breeders.⁴⁶ Issued with long leases by central governments and without consultation with customary right holders, such appropriations are significantly reducing the amount of grazing land available in some areas, crowding out riverine pastures used as dry season reserves, obstructing access to permanent watering places, and indirectly increasing pressure on remaining rangeland with a consequent deterioration in productivity. The root of the problem is the nationalization of land by central governments that was formerly subject to locally recognised grazing rights, together with the fiction that uncultivated land is 'waste' or unoccupied, leading to exaggerated estimates of the amounts of land available for investment in biofuels, export crops (sugar, cotton), or ranching.

An agrarian model of an emerging farmland mosaic is provided by the emergence of permanent agriculture in the semi-arid areas of Machakos and Makueni Districts of Kenya.⁴⁷ Between 1948 and 1978, forest and scrubland decreased and cultivated land increased in parallel with settlement, an evolution in land tenure that strengthened individual rights, growing markets, and an increasing labour force. The former dependence of the Akamba farmers on cattle, grazed in common pastures, gave way to private and sometimes improved grazing plots occupying about a

⁴³ Western, D., *pers.com.* for this case study

⁴⁴ Kratli, S. (2010). Karamoja with the rest of 'the rest of Uganda.' *Nomadic Peoples*, 14/2: 3-24

⁴⁵ Stites, E. and C.S. Huisman (2010), *Adaptation and resilience: responses to changing dynamics in northern Karamoja, Uganda*. Feinstein International Center, Tufts University; Levine, S. (2010), "What to do about Karamoja?" *Why pastoralism is not the problem but the solution. A food security analysis of Karamoja*. FAO

⁴⁶ Flintan, F. (2011). *Summary Brief: The causes, processes and impacts of land fragmentation in the rangelands of Ethiopia, Kenya and Uganda*. REGLAP; *Summary Brief: Why halting the fragmentation of the rangelands will improve the drought resiliency of Ethiopia's pastoralists?* REGLAP; Evans, A., *ibid.*

⁴⁷ Tiffen M. et al., *ibid*, Chapter 5.

third of the family holding. On the remainder, intensification based on the construction of soil and water conserving terraces, manuring and other forms of investment controverted the then prevailing Malthusian model of natural resource management.⁴⁸ Parallel transitions to more sustainable farming practices on increasingly scarce and valuable land have also been documented in West Africa.⁴⁹ However, a hillier, sub-humid topography may limit the applicability of this 'Machakos model' in extensive semi-arid or arid lowlands, and its sustainability has been disputed.⁵⁰

Additional linkages tie crop production with tree management on and off farmlands, especially in nutrient cycles such as the N-fixing *Faidherbia albida* tree. Evidence from repeated photography of landscapes in Eritrea indicates significant 'greening' in tree and shrub growth over several decades.⁵¹ Parallel, counter-intuitive findings emerged from similar studies in Kenya,⁵² and positive trends in vegetation have been observed in rangeland there.

On the other hand, the 'sustainable rangeland model' has been characterized as incapable of supporting the increased numbers of livestock necessary to provide pastoral livelihoods for increasing human populations.⁵³ Evidence for this is found in government livestock statistics for northern areas of Kenya, which show no increase over the last 40 years, while human populations have risen four-fold.⁵⁴ Mobile pastoralism is efficient in arid grasslands, compared with many unsuccessful attempts to introduce ranching models,⁵⁵ and deserves to be protected, but this does not preclude advances based on (rather than conflicting with) indigenous practice.⁵⁶ After all, pastoralists practice a sophisticated form of rotational grazing.

A priority for the rangeland model is therefore the protection of its salient features as a condition for its sustainability, whereas for the agrarian model, change is intrinsic and the priority is the elimination of degradation. Soil fertility is a prime target, as identified in a large literature on sustainable land management (SLM), conservation agriculture (CA),⁵⁷ and biological approaches to

⁴⁸ Tiffen, M. & Mortimore, M. (1994), Malthus controverted: the role of capital and technology in growth and environmental recovery in Kenya. *World Development* 22/7: 997-1010

⁴⁹ Mortimore, M., Ba, M., Mahamane, A., Rostom, R. S., Serra del Pozo P. & Turner, B. Changing systems and changing landscapes: measuring and interpreting land use transformation in African drylands' *Geografisk Tidsskrift. Danish Journal of Geography*, 105/1, 101-118

⁵⁰ Siedenberg, J. (2006) The Machakos case study: solid outcomes, unhelpful hyperbole. *Development Policy Review*, 24/1: 75-86; Tiffen, M. and Mortimore, M., Response: forwards to new challenges, not backwards to prescription, *ibid.*, 87-104; Seidenberg, J., Rejoinder: farmers deserve better, *ibid.*, 105-106

⁵¹ Nyssen J., Frankl A., Munro R.N., Billi P. & Haile M. (2010) Desertification? Northern Ethiopia re-photographed after 140 years. *Science of the Total Environment* 407 2749-2755; Munro, N.R., J. Deckers, M. Haile, A.T. Grove, J. Poesen, & J. Nyssen (2008), Soil landscapes, land cover change and erosion features of the Central Plateau region of Tigray, Ethiopia: photo-monitoring with an interval of 30 years. *Catena* 75: 55-64

⁵² Mortimore M. & Tiffen M. (2002), 'Questioning desertification in dryland sub-Saharan Africa' *Natural Resources Forum*, 26/3, 218-233.

⁵³ Sandford, S. (2011). Too many people, too few livestock: the crisis affecting pastoralists in the Greater Horn of Africa. A thesis

⁵⁴ Avery, S.T., *ibid.*, citing District livestock officers

⁵⁵ Western, D. (1982). The environment and ecology of pastoralists in arid savannas. *Development and Change*, 13: 183-211

⁵⁶ Western, D. (2012). Better grazing practices hold key to Kenyan droughts. *SciDev Net* 5 August, 2012. Nairobi: African Conservation Centre

⁵⁷ Milder J. C., Majanen T. & Scherr S. J. (2011). Performance and potential of conservation agriculture for climate change adaptation and mitigation in Sub-Saharan Africa. WWF/CARE

soil systems.⁵⁸ In semi-arid conditions, organic fertilization is superior to inorganic (and more affordable) but always in short supply, owing to constraints on the number of animals. This linkage ensures that sustainability is tied to the system dynamics, a relationship found all over Africa.

Natural resource management is thus embedded in long- and medium-term dynamics as well as in short-term variability. In the past, rapid diagnosis followed by untried prescription has dogged development interventions. A deeper understanding of system relations and dynamics will improve project design and practice. However, land use and cover dynamics are also driven by external forces such as the extension of large-scale farming, for example in the Serengeti-Mara region.⁵⁹

The complex political economy that expresses these and other stresses has given rise to an ominous increase in conflict in some East African drylands. There are few data on the extent and configuration of such conflicts and their spillover effects on neighbours (for example, between Somalia and Kenya), but it is a reasonable hypothesis that investment (whether large-scale commercial or a micro-scale at the family level) is held back under conditions of insecurity. A review of evidence from conflict situations has not been undertaken for the present study.

2.5 Growing and extending markets

In an increasingly monetized world, smallholders (whether farmers, pastoralists or agro-pastoralists) need, and participate more and more in market transactions.⁶⁰ Throughout sub-Saharan Africa the subsistence function of production systems is declining as the central pivot of livelihoods. This trend is unstoppable and is proceeding independently of environmental change, amplifying its effects. It means that, as they adapt to change, climatic and economic, poor people are doubly exposed.

Global commodity prices - especially of food grains - peaked at unprecedented levels in 2009-11, thereby threatening food-deficient households, including those of pastoralists dependent on the exchange of animal products for grain. Relative prices of food grain and livestock tend to be inverted during food scarcity, penalizing livestock producers. When global prices (wheat, maize, rice) rise, those of local substitutes (millet, sorghum, local maize) tend to follow. Besides these effects, the local prices of food commodities - especially where unregulated - mirror average yields which in turn reflect the intensity of droughts, as shown long ago in the Sahel Drought of the 1970s.⁶¹

Livelihood diversification is a strategy for households and individuals to sell their labour, skills or knowledge in markets outside the home, farm or grazing range. Contrary to the stereotype, it is

⁵⁸ See for example Uphoff, N. et al. (eds.) (2006). *Biological approaches to sustainable soil systems*. New York, CRC Taylor & Francis

⁵⁹ Homewood K., Lambin E.F., Coast E., Kariuki A., Kikula L., Kivulia J., Said M., Serneels S. & Thompson M. (2001). Long term changes in Serengeti-Mara wildebeest and land cover: pastoralism, population, or policies? *PNAS* 98/22:12544-12549

⁶⁰ Davies, J. *ibid.*

⁶¹ Mortimore, M. (1989). *Adapting to drought: farmers, famines and desertification in West Africa*. Cambridge University Press: 89-97.

commonly resorted to by pastoralists.⁶² The critical constraint is the absorbing capacity of the non-farm (or range) informal sector. The government cannot directly intervene to create employment on a large scale. It is also a fact that less income security may be offered than back home on the farm or range.

Thus increased market participation, though inevitable, carries its own risk portfolio. The food security crisis of 2011 and those preceding it may be viewed as market failures. This is consistent with the concept of entitlement promoted by Amartya Sen.⁶³ In Nigeria, the food crisis of the 1980s had less impact than that of the 1970s (the 'Sahel Drought'), because food markets performed better.⁶⁴ Nevertheless, the capacity of a market system to expand its reach to compensate for a failure in subsistence production should not be taken for granted.

The droughts of the first decade of the century are also believed to have increased social and economic differentiation in pastoralist communities. This tends to occur during food security crises as assets are sold by the poor and converted into consumption, providing the better off with opportunities for accumulation - whether of livestock or of land. Vulnerability, thus extended socially, may weaken communities even more when the next crisis occurs.

Drought insurance has been tried in a number of countries, but its costs, if financed by governments, make it unsustainable in the long run.⁶⁵ Private sector involvement is necessary to create a market for insurance, but risks to the insurer are high and only better off farmers or livestock keepers are likely to be prepared to pay premiums. There is another risk particular to pastoralists. Removal of the periodic cull through livestock mortality during droughts could lead to stock accumulation eventually leading to overgrazing and erosion.

Within the accepted view of pastoralists as reluctant to abandon their herding responsibilities and lifestyle there is believed to be plenty of evidence that young adult males in particular are taking to the road in order to diversify family incomes. Over the longer term, urbanization drives demand for food commodities - both locally produced and imported, depending on the popularity of imported wheat and rice. In a relatively urbanized country such as Nigeria, food and livestock production for internal markets has largely replaced export outside the region. However, niche markets for some high value products, including those gathered from the wild, are expanding in dryland countries.⁶⁶

Potentially vast market opportunities in Africa are being claimed for a new family of global commodities and services. First, food-deficit countries, especially in the Middle East, are acquiring leases on extensive areas of land for direct investment in food commodities for immediate export, as part of a global rush of interest in agricultural land.⁶⁷

⁶² Devereux S. (2006). Vulnerable livelihoods in Somali Region, Ethiopia. IDS Research Report 57, Institute of Development Studies at the University of Sussex; D J Watson and J van Binsbergen (2008), Livelihood diversification opportunities for pastoralists in Turkana, Kenya. ILRI Research Report 5

⁶³ Sen, A (1981), Poverty and famines: an essay on entitlement. Oxford: Clarendon Press

⁶⁴ Mortimore M. (1989) *ibid.*

⁶⁵ Hazell P.B.R. & Hess U. (2010), Drought insurance for agricultural development and food security in dryland areas. Food Security 2/4 395-405.

⁶⁶ IUCN (2011), *ibid.*

⁶⁷ The World Bank (2010), Rising global interest in farmland. Can it yield sustainable and equitable benefits? Washington DC: The World Bank

Second, biofuel production, especially from the *Jatropha* shrub, is advocated on a large scale for export or for reducing national oil import bills, such as those of Kenya.⁶⁸ The relevance of biofuel production to pastoralists is sharpened by the fact that much unclaimed semi-arid land said to be suitable for *Jatropha* is subject to customary grazing rights. Much is also suspected to be farmland under fallow.

Third, payments for environmental services (PES) such as river catchment protection already under trial in some countries, appears to offer the possibility of enhanced livelihoods for farmers and pastoralists. The scope for PES will be dramatically increased if carbon markets satisfy the claims made for them on a large scale.⁶⁹ Carbon sequestration by rangeland plant communities (grassland, shrubland or savanna woodland) is not insignificant. But it remains to be seen if rangelands - under grazing - can compete in carbon markets against biomes with higher per hectare potentials.⁷⁰ Widespread invasion of *Prosopis juliflora* may affect potentials. In three African schemes, existing local institutions, secure land tenure, community control over management decisions and flexible payment were found to be critical.⁷¹

The resurgence of interest in large scale farming introduces a major new level of risk for small-scale cultivators relying on customary rights, and still more for pastoralists who depend on grazing rights that have no expression in law. At local level, land is commonly a contributor to conflict situations, e.g., in the Lower Omo and Somali Regions of Ethiopia.⁷² Their political marginalization in many countries undermines their ability to seek redress when incursions are made into seasonal grazing areas by new holders of statutory rights issued by central government. Asymmetrical access to the law by corporations or privileged individuals in effect sets up an unregulated land market in which the law becomes dysfunctional to 'traditional' right-holders. Governance thus becomes a key issue.

It may be concluded that well-being, in terms of both income and benefits from ecosystem services,⁷³ is increasingly dependent on mobility, markets and diversification, for farmers and pastoralists alike. Increasing market participation has a part to play in resolving the 'pastoralists' dilemma' but is as likely to increase risk as reduce it. Moreover, the choices faced by pastoralists may not always be compatible (for example, trading off herding labour against urban migration).

2.6 Investment

The arid and semi-arid rangelands used to be viewed by many as unproductive investment 'sinks' inhabited by pastoralists who are resistant to change, and who operate an unproductive and inefficient production system. By 'inappropriate' land use practices, they 'overgrazed' the range, causing degradation. The transformation of these systems by 'modern' methods (such as ranching)

⁶⁸ GTZ (2008). A roadmap for biofuels in Kenya: opportunities and obstacles. Federal Ministry for Economic Cooperation and Development, Bonn, Germany

⁶⁹ UN EMG (2012), *ibid.*, Chapter 3

⁷⁰ UN EMG (2012), *ibid.*, 82-86

⁷¹ Dougill, A.J., Stringer, L.C., Leventon, J., Riddell, M., Rueff H., Spracklen D.V., Butt E. (2012), Lessons from community-based payment for ecosystem services: from forests to rangelands. *Phil. Trans. of the Royal Society B*: 367, 3178-3190

⁷² Avery, S.T., *ibid.* Ayele Gebre-Mariam (2005). The critical issue of land ownership. Working Paper 2. NCCR North South

⁷³ WRI (2005). Millennium Ecosystem Assessment. Washington DC: World Resources Institute

was an objective of development policy. Little notice was taken of the fact that mobile pastoral systems, such as that of the Afar in Ethiopia, incorporate sensitive risk minimization strategies which work through social institutions based on the principle of collective responsibility for the poor or unfortunate.⁷⁴

However, following the discoveries that mobile pastoralism can be more efficient than western-style ranching,⁷⁵ that 'opportunistic stocking' is a more productive strategy than restricting livestock numbers to a notional 'carrying capacity',⁷⁶ that rangeland ecology in drylands is driven primarily by rainfall rather than grazing pressure,⁷⁷ that the ecosystem tends not to return to an equilibrium state after disturbance but is non-equilibrial in nature,⁷⁸ and that uncertainty is the driving principle of dryland adaptation,⁷⁹ a major revision took place in scientific understanding, aligning rangeland ecology with the growing school of resilience theory founded by Holling.⁸⁰ However, 'new rangeland ecology' is not universally accepted by range scientists and governments.⁸¹ It has opened a gulf between advocates of mobile pastoralism and 'modernization' strategies still preferred by some governments.

These changes in scientific understanding are directly relevant to dryland investment. Drylands in poor countries are not only ecologically arid or semi-arid - they were avoided by investors to the extent of being virtual 'investment deserts'.⁸² But investment is the keystone of development. This is obvious from observing drylands in richer countries (USA, Australia, Israel). Policies, therefore, may be evaluated in terms of their impact on investment, whether directly through projects and programmes in the public sector, or indirectly through providing incentives for private investment.⁸³ In fact, investments can pay in drylands as has been shown for some development projects in Africa, for agro-ecological landscapes sustained by the micro-investments of smallholders, and for service provision in Indian states.⁸⁴

A recent UN report outlines the scope and opportunities for dryland investment by the public, private, voluntary and community sectors.⁸⁵ Market-driven trends in dryland intervention have been noted above. Those involving the appropriation of land and water - especially when scarce - frame a clash between customary rights to pasture and water on the one hand and outsiders armed with title issued by central government on the other. The resulting conflict of interest is not

⁷⁴ Davies, J. and Benett, R. (2007). 'Livelihood adaptation to risk: constraints and opportunities for pastoral development in Ethiopia's Afar Region', *Journal of Development Studies*, 43/3: 490-511

⁷⁵ Western, *ibid.*

⁷⁶ Sandford S. (1983), *Management of pastoral development in the Third World*. Chichester: John Wiley

⁷⁷ Ellis J.E. & Swift J.M. (1988), *Stability of African pastoral ecosystems: alternative paradigms and implications for development*. *Journal of Range Management* 41/6: 458-9

⁷⁸ Behnke R.H., Scoones I. & Kerven C. (eds., 1993), *Range ecology at disequilibrium: new models of natural variability and pastoral adaptation*. London: Overseas Development Institute

⁷⁹ Scoones I. (ed., 1994) *Living with uncertainty. New directions in pastoral development in Africa*. London: Intermediate Technology Publications.

⁸⁰ Holling, C.S. (1973), *Resilience and stability of ecological systems*. *Annual Review of Ecology and Systematics*, 4: 1-23.

⁸¹ Njoka, Prof., *pers.com.*

⁸² EMG (2011), *Global drylands: a UN system-wide response*. United Nations Environment Management Group. Nairobi: UNEP

⁸³ Knowler D., Acharya G. & van Regensberg T. (1998), *Incentive systems for natural resource management. The role of indirect incentives*. Rome: FAO Investment Centre

⁸⁴ Global Mechanism of the UNCCD (2005), *Why invest in drylands?* Rome: Global Mechanism for the UNCCD at IFAD

⁸⁵ United Nations, *ibid.*

simply that between old and new. The livestock sector - predominantly managed by mobile pastoralists - contributes a substantial proportion of export earnings, e.g., in Ethiopia (15-20% of GDP) and Somalia. Yet extensive *Jatropha* farming on rangeland, or sugar plantations on riverine pastures, could significantly damage sector productivity.

Thus capital inflow to the pastoral regions sets up new sources of uncertainty and change, at whose hands the mobile populations face new risks.⁸⁶ These will be traded off by policy makers against the value added to regional output by new enterprises. Neither is this challenge confined to the activities of large-scale investors. At a micro-scale, conflicts of interest are multiplying along perennial rivers where small-scale irrigation is rapidly expanding, often without public sector involvement, and access by livestock to both water and premium pasture is threatened. Mobile pastoralists are themselves taking up small-scale irrigation, internalizing these difficult choices within the family or community.

Investment potentials assume a new significance in the context of expanding small-scale irrigation in the ASALs. In Kenya, where only 20% of potential irrigated land is developed, the conditions for such expansion include the availability of loans, suitable technologies, water on the farm, services and markets.⁸⁷ These conditions are often not met in the ASALs, and credit institutions may be deterred by the high levels of risk. In the higher potential agro-ecological zones, however, small-scale irrigators can take advantage of one of Africa's best developed and diversified systems of financial services. To moderate risk for individual ASAL irrigators, water users' associations or public-private partnerships may offer more scope.

Thus uncertainty is driven by land tenure insecurity, economic, policy, and financial factors, and conflict, as well as natural variability, food insecurity, and food aid interventions. The Somalia famine of 2011,⁸⁸ and its predecessors, set a premium on investing in resilience during favourable years in the 'drought cycle'. Such is the aim of local preparedness strategies of farmers and livestock owners - strategies which may be losing scope under contemporary conditions.

Uncertainty and change contribute to the marginalization of pastoral peoples in the political economies of many dryland countries.⁸⁹ The MDGs, the efforts of the UNCCD and UNDP,⁹⁰ and the publication of national policy papers (see next chapter) notwithstanding, pastoral peoples are a long way from asserting their citizenship rights in open democracies. The role of investment in the 'pastoralists' dilemma' may likely be to increase inequality: between those who can afford to invest (for example, in herd growth, motor vehicles, electronic communications, or irrigation infrastructure) and those who lose what capital they possess through livestock mortality in droughts.

⁸⁶ Flintan, F. (2011) Summary Brief: the causes, processes and impacts of land fragmentation in the rangelands of Ethiopia, Kenya and Uganda

⁸⁷ Grimm M. & Richter M. (n.d.), Financing small-scale irrigation in sub-Saharan Africa. Part 2: Country Case Study Kenya. GTZ/ The World Bank

⁸⁸ Maxwell D & Fitzpatrick M. (2012). The 2011 Somalia Famine: context, causes, and complications Global Food Security 1: 5-12

⁸⁹ Morton J. (2010). Development for the world's mobile pastoralists: understanding, challenges and responses. An Inaugural Professorial Lecture, University of Greenwich

⁹⁰ Dobie, P and Goumandakoye, M. (2005). The Global Drylands Imperative: achieving the Millennium Development Goals in the drylands of the world. Nairobi: UNDP Drylands Development Centre; Middleton N., Stringer L., Goudie A. & Thomas D. (2011). The forgotten billion: MDG achievement in the drylands. UNCCD/ UNDP

3. The policy context

The shock of repeated droughts in 2002, 2006, 2008 and especially 2011 in the Horn of Africa catalyzed the driving forces and the justification for seeking fresh policy and development initiatives in the region. The 'Charter to end extreme hunger' sets out five imperatives:

- Fix the flaws of the international emergency system
- Support local food production
- Protect and provide services for the poorest
- Ensure affordable food for all
- Reduce armed violence and conflict

Development of viable livelihood opportunities for all pastoralists (and not only the better-off) is central to these aims. The Charter re-committed to the global L'Aquila Food Security Initiative (AFSI) of 2009, which refers to agriculture but does not highlight the role of livestock in agricultural production.

While the legal framework for governance of pastoral areas is necessarily constructed at national level, continental and regional organizations have an important role in setting goals, harmonizing and facilitating instruments that are ratified by governments.⁹¹ This reflects the regional distribution of dryland ecosystems, the existing mobility of livestock between countries, and increasing interlocking of market systems throughout the Horn of Africa. We begin therefore with regional instruments.

3.1 AU (African Union) Policy Framework for Pastoralism in Africa⁹²

This (2010) document sets out shared aims and objectives at the continental scale, specifically to secure a future for pastoralism and to enhance its economic contribution. Recognizing the diversity of environments, systems, and economic contexts, the colonial and post-colonial policy environments, and recent advances in understanding the rationales and efficiencies of pastoral systems, the document sets out a framework consisting of: (1) recognizing pastoralists' rights; (2) setting up a policy process; (3) recognizing that pastoralism is both a way of life and a production system; (4) supporting mobility with legitimacy, secure tenure and trading systems; (5) taking a regional approach to cross-border movements; (6) managing risks through service delivery and disaster management; (7) building on existing policies and updating as necessary; and (8) improving markets and financial services.

This Framework, which can be taken up at national level as well as guiding international programmes, promotes support for an evolving pastoralism rather than its radical replacement. It does not set mobile pastoralism within a wider range of livelihood options including agricultural and income diversification strategies, assuming that these issues will be mainstreamed within

⁹¹ The High-Level Meeting on National Drought Policy (Towards more drought resilient societies), Geneva, 11-15 March, 2013, proposed five goals for national drought policies: mitigation, planning and risk management; international collaboration; insurance; safety nets; and coordination (www.hmndp.org).

⁹² African Union Commission, Department of Rural Economy and Agriculture (2010). Policy Framework for Pastoralism in Africa: securing, protecting and improving the lives, livelihoods and rights of pastoralist communities. Addis Ababa: AU

other AU policies. IGAD and the EAC are now developing regional versions and it is suggested that this broader approach would be appropriate.

3.2 COMESA (Common Market for Eastern and Southern Africa)

According to COMESA, policy coherence is essential in pastoralist areas where a number of potentially divergent actors engage simultaneously in interventions in a context of food security crisis.⁹³ Sectoral policies can be shared or harmonized between countries with obvious benefits. There is advantage to be gained from standardizing cross-border marketing controls and marketing policies to make exporting livestock easier for mobile pastoralists faced with international standards.

The Policy Framework for Food Security in Pastoralist Areas (PFFSPA) is under Pillar III of the CAADP and aims to increase food supply, reduce hunger and improve responses to emergencies. It begins with a comprehensive, multi-disciplinary situation analysis organized around a sustainable livelihoods approach. Policies and strategies are then examined in a detailed and targeted framework as they relate to the household and community level. It recognizes that households manage their assets under complex policy environments at national, regional and international levels, and in a context of chronic vulnerability.

The Pillar III objectives - to increase food supply and reduce hunger - prioritize (1) increasing livestock food and income, especially milk for children, (2) protection of livestock assets (including animal health), (3) support to poorer owners to increase their herds (e.g. credit), (4) piloting diversification options to increase income (especially for the destitute), and (5) evaluation of safety nets (social protection).⁹⁴ The PFFSPA will include analytical capacity needs for a policy process based on these principles. It includes food security strategies for different categories of vulnerable groups, or differing levels of mobility. The proponents of this methodology have a broad vision of its possible applications, and capacity to take account of the diversity, changeability and uncertainty of pastoral livelihoods.

However, its authors admit that conflict management, health and education fall outside its scope (as defined by the CAADP Pillars, which have a strong focus on agriculture). Livelihoods outside agriculture (which includes livestock) are secondary to its objectives.

3.3 IGAD Drought Disaster and Sustainability Initiative (IDDRSI)

Founded in 1986, in response to the drought cycle of the early 1980s, IGAD operates at the Heads of State level, maintains a range of specialist groups, and co-ordinates all interested parties on drought and related issues. In particular, conflicts of interest - including those related to natural resource management - need an interstate organization. Cross-border protocols, regional markets, technical advice (such as the FAO's pastoral services programmes), financial services and advocacy are among its priorities. Research linkages have developed in water management, climate change and early warning systems (EWS).⁹⁵

⁹³ COMESA (2009), Policy framework for food security in pastoralist areas. Common Market for Eastern and Southern Africa, Comprehensive African Agriculture Development Programme (CAADP) Pillar III

⁹⁴ COMESA, *Ibid.*: 51

⁹⁵ Kori, P., *pers.com.*

Following the drought of 2010-11, national governments, the AU, IGAD and other organizations came together to address the underlying causes of vulnerability in the region, particularly among pastoralists and agro-pastoralists, under an initiative called IGAD Drought Disaster Risk and Sustainability Initiative (IDDRSI) and to promote drought risk reduction, ecosystem rehabilitation and sustainable livelihoods. Country Programming Papers were prepared for Ethiopia, Kenya and Uganda. A Technical Consortium was formed of the CGIAR institutes and the FAO Investment Centre (funded by USAID) to provide investment expertise.⁹⁶ The draft papers were criticized for avoiding the fundamental causes of the crisis, and paying little attention to the social benefits of the proposed investments, community engagement and transparency.⁹⁷

3.3.1 Ethiopia⁹⁸

The key policy documents relevant to pastoralism are: (1) the policy framework, Agricultural Development Led Industrialization (ADLI), which recognizes three intervention zones - adequate rainfall, moisture stress, and pastoral; (2) the Growth and Transformation Plan (GTP) 2011-2015, which promotes commercial agriculture, including private investment in lowland areas where abundant land exists; (3) the Agriculture Sector Policy Investment Framework 2010-2020, a road map which identifies priority areas and estimates investment costs; (4) regional development plans which reflect the four Pillars of the CAADP;⁹⁹ (5) the Ethiopia Strategic Investment Framework (ESIF); and several agencies concerned with pastoral areas, including the promotion of sustainable land management (SLM).¹⁰⁰

Earlier measures, such as the National Policy on Disaster Prevention and Management (NPDPM) 1993 had promoted voluntary settlement and diversification into agriculture and non-livestock livelihoods, but in a highly centralized framework.¹⁰¹ The Draft Policy Statement for the Sustainable Development of Pastoral and Agro-pastoral areas of Ethiopia (2008) promised support for irrigation, and the Plan for Accelerated and Sustained Development to End Poverty planned technical support for settlement and agriculture. Constitutional provision, under a mandate of decentralization, for the protection of rights to grazing and compensation for appropriated land has not, however, been generally implemented. On the other hand, the GTP has a target of 3.3 m ha to be transferred to private sector commercial agriculture by 2014-15 (which may be compared with a total transferred before the GTP of 0.9 m ha.¹⁰² The Ethiopian Water Resources Management Policy aims for sustainable use, conservation, and community involvement.

The Country Planning Paper of 2012 claimed to address the underlying causes of vulnerability in the region, particularly among pastoralists and agro-pastoralists, to promote drought risk

⁹⁶ REGLAP (2012) Overview of the process and priorities for the IGAD ending drought emergencies initiative in the Horn of Africa: the need for 'Community Engagement for Transformational Change'. Regional Learning & Advocacy Programme for Vulnerable Dryland Communities.

⁹⁷ REGLAP (2012) Overview of the process and priorities for the IGAD ending drought emergencies initiative in the Horn of Africa: the need for community engagement for transformational change

⁹⁸ Ethiopia: Country Programming Paper prepared with the support of the Technical Consortium, CGIAR & FAO, 26 September, 2012 (DRAFT)

⁹⁹ Pillar 1: land and water management; Pillar 2: market access; Pillar 3: food supply and hunger; Pillar 4: agricultural research

¹⁰⁰ Flintan, F., *ibid.*

¹⁰¹ REGLAP (2013) Good practice principles - water development in the drylands of the Horn of Africa. FAO/ REGLAP

¹⁰² Evans, A., *ibid.*

reduction, ecosystem rehabilitation and sustainable livelihoods. Among government-implemented programs and projects (and most relevant for the present purpose) are:

- Five-year development plan for arid and semi-arid lands (ASALs) which promote irrigation with voluntary 'villagization' along major rivers (Awash, Omo, Wabi Shabelle), aiming to resettle 170,000 with 1 ha of land and shared pumps.
- Pastoral service provision, rural water supply, and income diversification for pastoralists.
- Pastoral Community Development Project (World Bank assisted), focused on service delivery, livelihood diversification and disaster management.
- Food Security Program focused on chronic and transitory food insecure households in vulnerable *woredas* with safety nets, credit and extension, community investments, and support for resettlement.
- Peace Building and Conflict Resolution Program focused on early warning and response (including cross-border situations), education and promoting a culture of peace, and community policing.

Proposed interventions include integrating emergency response with development, for example by making financial provision for urgent expansion of safety nets in a time of food insecurity. Proposed areas of intervention include: (1) natural resource management (including rangeland management, irrigated forage, rural water supply, renewable energy and biodiversity), (2) markets and trade (transport, information, access to grazing and water, (3) financial services, trans-boundary controls), (4) livelihoods and services (livestock productivity, agricultural and fishery productivity, economic diversification, safety nets, health, nutrition and education), (5) disaster risk management (early warning systems, climate monitoring), and (6) conflict prevention, management and peace building. This comprehensive agenda appears to represent a significant expansion of government's responsibilities and its implementation may call for new capacity and finance. NGO participation has been and will continue to be important.

Ethiopia is an agrarian, smallholder economy with a persistent food security challenge. Nevertheless it has achieved a GDP growth in the last two decades, at >7% in 2012. Natural resources management and social policy has traditionally been highly centralised. There is a danger of seeking sectoral solutions and of failing to distinguish the different needs of highland and lowland Ethiopia. Irrigation has a major role to play in the lowlands; using water resources whose quantification and mapping still present a challenge.¹⁰³ An integrated smallholder-based approach to solving food insecurity is vigorously advocated in a recent study of national development.¹⁰⁴

3.3.2 Uganda¹⁰⁵

Uganda, while sustaining GDP growth over two decades, remains an agricultural country and within this sector, livestock is persistently under-developed (7.5% of agricultural GDP). The 'cattle corridor' and the north (Karamoja) are home to pastoral and agro-pastoral communities. The strategic importance of Uganda within the IGAD region is as a food basket, needing to increase production and productivity sustainably, and to trade the surplus in regional markets.

¹⁰³ Headey D., Taffesse A. S., You L. (2012). Enhancing resilience in the Horn of Africa. An exploration into alternative investment options. IFPRI Discussion Paper 01176, Washington DC: International Food Policy Research Institute

¹⁰⁴ Starling, S. (2011) (*Unfinished draft*) From recurrent crisis to food security in Ethiopia. Draft 4, Oxfam GB

¹⁰⁵ Uganda: Country Programming Paper to End Drought Emergencies in the Horn of Africa, March 2013

Uganda has also decentralized the institutions of governance in recent years. The National Development Plan defines strategy and has targeted a growth rate of >5% in the livestock sector.¹⁰⁶ Earlier instruments, the Plan for the Modernization of Agriculture (PMA) 2001 and the Water for Production Strategy 2005-20035, have been absorbed under this framework. For the drylands or cattle corridor (84,000 sq km or 40% of the country), a Rangeland Policy and a Pastoral Code are still in the making and dryland development is not mainstreamed in economic policy; violent conflict still occurs in Karamoja, the most marginalised area. However, there is now a National Policy for Disaster Preparedness and Management (DPM) which will have a heightened profile.

Existing and planned initiatives in the Country Planning Paper include:

—Supporting existing planning instruments:

- (1) The National Development Plan (2010-14),
- (2) the Agricultural Sector Development Strategy and Investment Plan (2010/11- 2014/15),
- (3) the Strategic Investment Framework for Sustainable Land Management (2010-20), (4) the Framework for Irrigation Master Plan (extending irrigation, which has a potential of 202,000 ha, of which only a third is currently used), (5) the National Trade Sector Development Plan (2008/9-2012/13), (6) the Integrated Dryland Development Programme (2003), (7) the National Peace, Reconstruction and Development Plan for Northern Uganda, (8) the Karamoja Action Plan for Food Security (2009-14), (9) the National Land Use Policy (2008), (10) the National Environment Policy (1995), (11) the Water for Production Strategy and Investment Plan (2005-35), (12) the National Action Programme to Combat Desertification (NAP), (13) the National Environment Action Plan (NEAP, 1994), and departmental policies;

—Combining and coordinating humanitarian and development initiatives, and enhancing institutional capacity to manage drought, build resilience and reduce vulnerability.

—Specific interventions in (1) natural resource management (water, land and pasture development, resource access, environmental management); (2) market access and trade (transport, livestock mobility, financial services, trans-boundary disease control and standards); (3) livelihood support (livestock production and health, agricultural production, fisheries development, income diversification, safety nets, basic services); (4) pastoral disaster risk management (early warning and response, climate change monitoring and adaptation); (5) knowledge management (adaptive research, extension and advice, communication); and (6) conflict resolution and peace building.

Such a comprehensive vision raises questions about financing which are acknowledged, though not solved, in the document.

¹⁰⁶ Flintan, F., *ibid.*

Kenya¹⁰⁷

For more than a decade, Kenya's water policy was governed by a Sessional Paper (No. 1 of 1999) on National Water Policy on Water Resources Management and Development.¹⁰⁸ This policy promoted private sector involvement in water provision, in an attempt to rectify the faults experienced in very many public water schemes, whether because of inappropriate technology or unsuitable governance. The last Government's Economic Recovery Strategy (ERS) and Interim Poverty Reduction Strategy (IPRSP) 2000-2003 had a bearing on irrigation, but the Water Act of 2002 superseded them. It reorganized the institutional setting of the water sector, regulated access and set up an authority with overall control.¹⁰⁹

Kenya's Country Programme Paper has been developed into a Medium Term Expenditure Plan (MTEP) for drought management and resilience with an approved Government budget. The key objectives are:

- to invest in infrastructure, security, human resources and natural resources,
- to develop institutions to manage drought and its consequences,
- to enhance the adaptive capacities of communities in managing ecosystems, and
- to monitor implementation and assess progress.

Kenya has an Emergency Humanitarian Response Plan with a multi-sectoral plan of work. Investment in the ASALs will focus on short-term recovery and medium to long-term strengthening of adaptive capacity. This will be consistent with the Kenya Vision 2030, which reaffirms the Government's commitment to the ASALs, the National Drought Management Bill, the Agricultural Sector Development Strategy, the National Climate Change Response Strategy, the National Social Protection Policy, the Policy Framework for Nomadic Education, and the strategy for Ending Conflict among Communities in Northern Kenya and other Arid Lands.

Past programmes have thrown up many lessons but in particular the need for participatory planning, local empowerment, and respect for human rights and dignity. Six components of the Country Programme are set out and appropriate interventions identified as follows:

(1) Peace and security: strengthening community-led institutions, law enforcement agencies, and monitoring.

(2) Humanitarian preparedness: coordinating drought management initiatives, strengthening early warning systems and response, transport, food reserves, risk reduction strategies, cross-border channels for assistance, meteorological capabilities, public-private partnerships.

(3) Climate-proofed infrastructure development: priority road building, markets and growth poles, rural water supply and multi-purpose dams, water management, ICT capabilities for information diffusion, livestock disease control, renewable energy.

¹⁰⁷ Republic of Kenya Programme Framework to End Drought Emergencies in the Horn of Africa: ending drought emergencies in Kenya (RESTRICTED circulation, August, 2012)

¹⁰⁸ REGLAP (2013) Good practice principles - water development in the drylands of the Horn of Africa. FAO/ REGLAP

¹⁰⁹ Grimm, J. & Richter, M. (n.d.) Financing small-scale irrigation in sub-Saharan Africa. Part 2: Country Case Study Kenya. GTZ/ The World Bank

(4) Building human capital: education/ training provision and access at all levels, financial support for education costs, provision and access to health facilities, sharing of experience.

(5) Sustainable livelihoods, adaptive to climate change including:

- rangeland management,
- environmental protection (including carbon credits),
- control of invasive plant species,
- regional ecosystem management,
- rainwater harvesting,
- small scale irrigation, with compensation for displaced pastoralists,
- fodder/forage farming,
- research on drought-tolerant crops,
- seed management,
- crop disease management,
- cold storage marketing,
- businesses,
- livestock marketing associations,
- enforcement of sustainable forestry,
- monetized community forestry schemes,
- fishing capacity and organizations, fishponds,
- social protection mechanisms,
- index-linked livestock insurance,
- livestock value chains and cross-border mobility,
- animal health,
- quarantine and phyto-sanitation,
- financial service provision to small businesses,
- youth empowerment,
- financial services to dryland people,
- cooperatives/ producer associations,
- participatory action research,
- field schools,
- knowledge dissemination,
- regional collaboration.

(6) Multi-sector and multi-stakeholder coordination for Ending Drought,

- financial support for coordination and capacity building,
- establishment of a National Drought and Disaster Contingency Fund,
- regional initiatives under IGAD, EAC and COMESA.

Implementation of this long agenda necessarily redefines the functions and responsibilities of many institutions in and outside government, and is addressed in detail in the document.¹¹⁰ Government budgets and expected donor support are used to estimate costs. The Medium Term Plan is now the reference point as it is embedded in the mainstream planning system across the sectors.

Two months after the above draft document was issued, a Sessional Paper on a national policy for the ASALs was launched.¹¹¹ This document, now enacted, focuses on an over-arching achievement of equity and integration for the ASALs. First, an enabling environment for development will be achieved by a series of commitments on infrastructure, human capital, security and the rule of law. Second, alternative approaches will be developed to delivering services, governance and public administration. Third, climate resilience of communities will be strengthened to ensure

¹¹⁰ *Ibid.*: 46-49

¹¹¹ Republic of Kenya, Office of the Prime Minister, Ministry of State for Development of Northern Kenya and other Arid Lands: DRAFT Sessional Paper of 2012. National Policy for the Sustainable Development of Northern Kenya and other Arid Lands, 'Releasing our full potential'. 11 October, 2012

sustainable livelihoods, through drought management, land and other natural resource management, livestock production and marketing, dryland farming and livelihood diversification, and measures targeting poverty and inequality.

The 82 policy interventions proposed are arranged under the following policy issues:

1. Strengthen national integration, cohesion and equity
2. Improve the enabling environment for development
 - Infrastructure development
 - Human capital
 - Security and the rule of law
3. Develop alternative approaches to service delivery, governance and public administration
4. Strengthen the climate resilience of communities and ensure sustainable livelihoods
 - Drought management and climate change
 - Land and natural resource management
 - Livestock production and marketing
 - Dryland farming
 - Livelihood diversification
 - Poverty and inequality

The Country Programme Paper and the Sessional Paper coincide on most recommendations. There is no budget estimate in the Sessional Paper, which however bears the marks of longer gestation, stronger analysis and more definitive recommendations. The new Agriculture, Livestock, Fisheries and Food Authority Bill gives a commercial focus to agriculture, which risks contradicting the livelihood focus of the MTEP and the ASAL Sessional Paper. A key challenge is thus ensuring that this legislation is implemented coherently.

3.4 Conclusion

The Country Papers will need ratification (except for Kenya, where the ASAL policy may be considered to have superseded it). All these policy statements are ambitious in financing and implementation terms. The response to the IGAD initiative has been enthusiastic, but the extent to which these plans indicate commitments of central governments to the reasoned arguments of the AU - rather than 'wish lists' - remains to be seen. Kenya - with its enacted ASAL policy - is in the lead. Its new institutional framework (up to cabinet level) will be able to support implementation and inter-sectoral coherence, give prominence to pastoralism in such sectors as livestock and education, and support stakeholder participation (e.g. through the ASAL Stakeholder Forum). Together with the protection given to previously neglected areas in the Constitution, dryland peoples may be able to use these opportunities to their advantage.¹¹²

If evidence were needed that development is seen as the ultimate answer to dryland poverty, climate risk and pastoral transition, these comprehensive policy and intervention strategies provide it. But issues of local ownership, participation and empowerment have to be addressed in implementing plans.¹¹³ Implementation, across such a wide spectrum, will challenge many departments of government, since past policies have often misjudged mobile pastoralism.¹¹⁴ It has

¹¹² Izzy Birch., *Pers. comm.*

¹¹³ REGLAP, *op.cit.*

¹¹⁴ Flintan, F. (2013). Plotting Progress. Integrated planning in the drylands of Kenya, Ethiopia and Uganda. REGLAP

been shown that certain narratives about the ASALs in Kenya had an 'unrelenting persistence' in the minds of policy makers and practitioners, and only under provisions of the new Constitution and Vision 2030 were the rights of ASAL people formally recognized and an Equalization Fund established to restore equity.¹¹⁵ In the 1960s, it was believed that investment should follow the best economic returns, which favoured high potential areas. This view was held by World Bank economists in the 1980s.¹¹⁶ But recent studies of economic returns to investment in semi-arid Asia have shown that lower potential areas, having missed out in the green revolution, may have potential for faster growth.¹¹⁷ However, these policy papers give grounds for hope that in the Horn of Africa, mobile pastoralism, dryland farming, small-scale irrigation and income diversification will be better integrated in the development process.

¹¹⁵ Odhiambo, M.O. (2013) The unrelenting persistence of certain narratives: an analysis of changing policy narratives about the ASALs in Kenya. A Position Paper for the New Perspectives on Climate Resilient Drylands Development Project.

¹¹⁶ Lele, U. and Stone, S.W. (1989) 'Population pressure, the environment and agricultural intensification in sub-Saharan Africa: variations on the Boserup hypothesis'. *Madia Discussion Paper 4*, the World Bank, Washington DC

¹¹⁷ Fan, S. and Hazell, P. (2001) 'Strategies for sustainable development of less-favored areas : returns to public investments in the less-favored areas of India and China' *American Journal of Agricultural Economics*, 83/5: 1217-1222

4. Pathways and Options

There are three major policy pathways open to governments, donors and NGOs in seeking to support development processes in pastoral regions:

1. Promotion of crop agriculture (large or small-scale, rainfed or irrigated)
2. Continued support for mobile pastoralism, albeit in new forms;
3. Facilitating income diversification (including migration).

REGLAP, IGAD and national governments believe that, given effective disaster risk reduction (DRR) strategies, drought should not in future become a food insecurity disaster. But mobile livestock production (Option 2), even if 'modernised', cannot support the increase in livestock numbers necessary to provide livelihoods for human populations growing at present rates. This is "the pastoralists' dilemma" - that is, in pursuing what has been shown to be (see Section 4.2) the best adapted land use system for arid rangelands, they must allow a fraction of the population to be driven out of the system. Poverty is the mechanism whereby this fraction is selected. Herd mortality peaks in or after droughts. It takes several years to reconstitute the herds and many fail to do so. Among the Afar, reproductive doubling periods are 8 years for camels, 5-6 for cattle, and 2-3 for small ruminants.¹¹⁸ Frequent droughts during the past decade reduced *average* livestock holdings from 10 TLUs to 4.¹¹⁹

Alternative or complementary livelihood strategies - Options 2 and 3 - are needed. Already, pastoralists are experimenting with both.¹²⁰ Such autonomous (or endogenous) livelihood responses should be included within the policy framework. Best practice should build on local knowledge and positive trends. Headey *et al.* (p 34) recommend for the policy level a 'balanced path involving both movements out of pastoralism and the transformation of pastoralism into a more commercialized and resilient sector'.¹²¹ They recognize, however, that there are knowledge gaps to fill and that the Horn of Africa is differentiated and needs spatially targeted approaches.

4.1 Option A- Crop agriculture

This is the primary focus of the present study. In context, this option consists of four distinct priorities (not mutually exclusive), distinguished on the basis of scale of organization and crop water source: large-scale ('commercial', mechanised) versus small (family-based, household managed); and rain-fed (with one or two short growing seasons) versus irrigated (by means of a range of technologies).¹²² This typology is not perfect, for example, where large-scale hydraulics, water management and contract schemes employ small-scale irrigators, who are differently placed from independent individuals.

¹¹⁸ Davies, J. and Bennett, R. (2007) Livelihood adaptation to risk: constraints and opportunities for pastoral development in Ethiopia's Afar Region. *Journal of Development Studies*, 43/3: 490-511

¹¹⁹ Davies, J. (2006) Capitalization, commoditization and obligation among Ethiopia's Afar pastoralists. *Nomadic Peoples* 10/1: 29-

¹²⁰ Devereux, S. (2006), Vulnerable livelihoods in Somali Region, Ethiopia. IDS Research Report 57, Institute of Development Studies at the University of Sussex

¹²¹ Headey D., Taffesse A.S., You L. (2012), Enhancing resilience in the Horn of Africa. An exploration into alternative investment options. IFPRI Discussion Paper 01176, Washington DC: International Food Policy Research Institute

¹²² Mati, B.M. (2007), 100 ways to manage water for smallholder agriculture in Eastern and Southern Africa. A compendium of technologies and practices. SWMnet Working Paper 13, IMAWESA.

'Small-scale' includes households from moderately prosperous to almost destitute; and 'irrigated' may be combined with pastoral interests. Such combination is termed 'agro-pastoralism'. This option is often initiated by herders unable to re-stock their herds after decimation by drought, but may become permanent. However, in the debate on the Horn of Africa, this is often casually joined with the term 'drop-outs' implying failure to sustain viable mobile pastoralism. While it may be the case that most agro-pastoralists invest their savings in livestock and some would like to return to mobile pastoralism, this cannot be the objective of interventions. For the purpose of development policy, mixing enterprises is better understood as a valid opportunistic strategy. A necessity of 'sloughing off' population into sedentary livelihoods is characteristic of mobile pastoral systems - perhaps at rates of up to 7-8% per year. In semi-arid West Africa, rainfed agro-pastoralism is not regarded as failure; settled Fulani households have larger farms, more animals and more sustainable production systems than co-resident farmers.¹²³

A summary analysis of the four simplified strategies in terms of strengths, weaknesses, opportunities and constraints is offered in the Table below.

Table 4.1: SWOC analysis of agriculture options

	Strengths	Weaknesses	Opportunities	Constraints
large scale rainfed	land deemed 'vacant' <i>low rents charged by government</i> access to new technologies	overriding of customary land/grazing rights <i>compensation costs</i> low average productivity/ha <i>variable yields/ losses/ profits</i> low local employment <i>dependence on subsidies</i>	rapid development, expansion <i>local/ export markets - food commodities, biofuel</i>	<i>impossible in arid areas</i> infrastructure costs <i>input costs, including fertilizers</i> weak market linkages <i>contested land claims</i> human resources (skills, supervision) <i>credit for capitalization</i> financial reserves for yield failure

¹²³ For example, Mortimore M. and Adams, W.M. (1999), Working the Sahel: environment and society in Northern Nigeria. London: Routledge

	Strengths	Weaknesses	Opportunities	Constraints
small scale rainfed	Opportunistic crop production (depending on rainfall)	high co-variate risk of loss in drought <i>clashing demand from mobile and sedentary activities</i> need for soil/water conservation <i>low yielding, drought escaping cultivars</i>	addition to livestock income <i>fodder production for sale</i> possible route to herd reconstitution	<i>impossible in arid areas</i> finding additional labour from small households <i>Shortage of private capital and credit</i> matching crops to ecosystems
large scale irrigated (corporate organization)	<i>low rents charged by government</i> access to new technologies <i>water year-round</i> high yield/ profit expectations <i>high local employment</i> input costs affordable	dispossession of customary water/ grazing rights <i>compensation costs</i> displacement of people from dam sites upstream <i>downstream disruption of flow regime, forage, irrigation/ domestic water</i> lowering of water table (evaporation losses) <i>salinization risk</i>	<i>local/ export markets - food commodities, industrial (cotton, sugar)</i> employment with high impact on income	<i>only possible with perennial water</i> infrastructure costs <i>weak market linkages</i> contested land/water claims human resources (new skills, supervision) <i>credit for capitalization</i> not focused on poor, may undermine resilience

	Strengths	Weaknesses	Opportunities	Constraints
small scale irrigated (supported scheme or independent)	locally negotiated acquisition and costs/ha, <i>adaptable to spatially variable/short-term water</i> , high yield/ profit expectations, <i>input costs affordable</i> , high participation possible at favourable sites, <i>reduced variability in household incomes</i> , minimal impact on flow regime and groundwater, <i>produce high value crops</i>	competing demands for human resources (livestock tending), <i>clashing demand from mobile and sedentary activities</i> , unfamiliarity with new markets, <i>technology transfer necessary (groups, radio, extension etc.)</i> , interruption of livestock corridors, <i>investment capital needed</i>	<i>stabilize household income in drought cycles (DRR)</i> diversification without migration to towns <i>alternative incomes for livestock-poor households</i> use local knowledge and practices, species <i>integrate intensive crop farming with livestock</i>	<i>Availability of suitable water sources</i> , Shortage of private capital and credit, especially for infrastructure, <i>Untrained human resources</i> , Scarcity of extension and input supply in remote places, <i>need for strong water users' associations</i> , invasive plants, pests, diseases, <i>land tenure insecure</i> , investment risk, low return on costs

4.1.1 Large scale rain-fed

Most of the opportunities for large-scale commercial farming in the semi-arid zone were taken up by European farmers in the colonial era and until recently, the issue was distribution rather than appropriation of land. However as part of a global impetus there is now rising corporate demand for land for producing food and industrial commodities (see Section 2.5).

Quantifications of this resurgence of large-scale rainfed farming are impossible because not only are estimates few and variable, but capitalization and development falls far behind the acquisition of leasehold rights, and the intended division between rainfed and irrigated farming is unknown. Whether because of surreptitious quasi-legal transactions involved,¹²⁴ or because central governments know that the opportunity costs of such farming are born entirely by pastoralist communities,¹²⁵ or because they are justified in the name of development - such as

¹²⁴ Galaty, J.G. (2013) Land grabbing in the Eastern Africa rangelands. In: Catley, A., Lind, J., & Scoones, I., Pastoralism and development in Africa. Dynamic change at the margins. Earthscan, 143-154

¹²⁵ Abdirizak Arale Nunow (2013) Land deals and the changing political economy of livelihoods in the Tana Delta, Kenya. In: Catley, A., Lind, J., & Scoones, I., Pastoralism and development in Africa. Dynamic change at the margins. Earthscan, 154-163

Jatropha for biofuel production in the oil-importing economy of Kenya,¹²⁶ there are many unknowns in the sector. Since global market conditions will determine the level of incoming investment, it is possible that performance will fail to match intention.

It is worth asking whether the transfer of land from mobile pastoralism to commercial farming will drive out pastoralists rather than providing them employment, since the technology is capital-intensive and will call for skilled labour.

4.1.2 Small-scale rain-fed

This type of production system is confined to the semi-arid agro-ecological zone where -unless appropriated in the early colonial wave of commercial farming - all available land is occupied by settled farming communities such as the Akamba of Machakos and Kitui in Kenya, where under conditions of and scarcity intensification of the smallholder system has occurred (see Section 2.5). Mobile pastoralism is effectively excluded from such areas by the privatization of smallholdings under customary rights and official registration of title. The farmers own livestock and pastures are privately managed.

Notwithstanding the wealth of local knowledge and more than half a century of agricultural research, dryland agriculture in Kenya and elsewhere in the HoA is capable of substantial advancement, according to a recent study, along the following lines:¹²⁷

- dry farming technologies including water harvesting and soil fertility management
- seed systems and availability
- weather forecasting and insurance
- pest and disease control
- post-harvest technology
- pasture improvement and crop-livestock integration
- fodder and hay production, silage, residues, and livestock feeding systems
- marketing and credit systems
- small-scale irrigation

Many of these opportunities also apply at the large scale.

4.1.3 Large scale irrigated

The potential for expanding irrigation - both large and small scale - is suggested in table 4.2 below.

Table 4.2: Expanding the irrigated area, Ethiopia, Kenya and Uganda

¹²⁶ GTZ, *ibid.*

¹²⁷ Recha, J., Kinyangi, J. & Omondi, H. (2013) Climate related risks and opportunities for agricultural adaptation in semi-arid Eastern Kenya. CGIAR and CCAFS Research Program on Climate Change, Agriculture and Food Security

Country	Existing irrigated area ('000 ha)	Potential expansion large scale ('000 ha)	Internal rate of return (%)	Potential expansion small scale ('000 ha)	Internal rate of return (%)	Total potential expansion ('000 ha)
Ethiopia	290	751	7.05	156	12	907
Kenya	103	288	7.04	50	40	338
Uganda	9	531	2.36	620	32	1151

Source: You et al., *ibid.*

Ethiopia has vast potential for irrigation, though considerable variance exists amongst the available estimates. The government plans to increase its present irrigated area from 640,000h to 1.8 million ha, but only 10% of this is in the Pastoral Zone. However a recent document estimates more than twice as much potential, much of it in the Pastoral Zone, using rivers that run down from the High Rainfall Zone in the highlands.¹²⁸ The data in Table 4.2 are outputs from modeling water availability for irrigation using a sophisticated methodology, which claims greater accuracy.

With the exception the Omo Basin, the entire potential that is being developed for commercial irrigation lies within the Pastoral Zone.¹²⁹ Downstream impacts on Kenya's Lake Turkana are being disregarded. Massive investments by the public sector and central control - which have characterized large-scale irrigation development in Ethiopia - will realize this potential, and revolutionize Ethiopia's economy, for example, by producing sugar for export. There are many unknowns. Besides downstream impacts, scheme performance, human capacity, supply of technical equipment, and environmental sustainability are major policy and planning issues. There is little quantified knowledge on hydrological resources in the pastoral zone, including groundwater and rates of recharge.

Large scale irrigation has an even more disruptive impact than large scale rainfed farming, since the riverine pastures, which are relatively scarce, are essential for the viability of grazing systems in the dry season and during drought. Riverine areas such as the Tana flood plain in Kenya have already attracted numerous corporations. It may be guessed that grantees will pick out the riverine or wetland patches of their giant holdings for early development, since economic returns should be higher there. Irrigated estates may offer peripheral benefits such as water, fodder (crop residues), or improved market access to local populations of sedentary ex-pastoralists, if micro-irrigation schemes are provided in interventions. Large-scale irrigation usually employs skilled labour from elsewhere.

4.1.4 Small-scale irrigated

From the evidence so far reviewed it is clear, in so far as we may generalise across the huge diversity of East Africa, that among crop agriculture options, only that of small-scale irrigation offers some scope for a transformation of mobile pastoralism, as an alternative to, or

¹²⁸ Gates Foundation (2010) Water-led development: key insights from the diagnostic of Ethiopia's irrigated agricultural sector CONFIDENTIAL MEMO

¹²⁹ Avery, S.T. *ibid.*

complementary with, livestock production. However, while there are considerable potentials for expanding irrigation, these potentials may still not be equal to the task of providing livelihoods for large ex-pastoral populations at improved living standards. The patchy success of many schemes shows that additional investments besides irrigation infrastructure are required - including access to improved seeds (for high value cultivars), fertilizer and other inputs, training, maintenance services and farmers' marketing organizations.¹³⁰

Two key questions need asking with respect to small-scale irrigation as a solution to the "pastoralists' dilemma": first, is there scope for expansion of the irrigated area? and second, what can be learnt from project experience about the economic costs and benefits of small-scale irrigation?

At the country level, an answer to the first of these questions is given in Table 4.2, though estimating potentials for small-scale irrigation where topography and hydrology vary over short distances is difficult. It suffices to say that abundant potential exists, even in Kenya where 85% of the land area is arid. But at the ecological level, can this potential meet the needs of pastoral populations? According to Sandford's calculations, 2.2 million ha of irrigable land, divided equally among a pastoral population of 19.3 million, could provide an average of 0.69 ha per pastoralist household in the Horn of Africa.¹³¹ However, this average hides huge differences between countries (1.25 ha for Ethiopia and 0.23 ha for Kenya). The assumptions must be that the 'pastoral population' will continue to grow, if more slowly, and, if riverine pastures are brought entirely under irrigation, mobile pastoralism as we know it will be mortally wounded.

Answering the second question is equally ambivalent, as few analyses have been carried out. Sandford reports on three 'pastoralist-related' irrigation schemes in Kenya and Ethiopia, with widely divergent cost levels and output values.¹³² He concludes that (excluding the Kenya example, which is in Turkana) 'the level of net benefits that can be achieved on pastoralist-related schemes is broadly compatible with the level of capital costs actually incurred in installing the irrigation systems' - provided that any opportunity costs of land and labour are ignored. This may be justified because of the low returns to alternative land uses (i.e., grazing) and non-agricultural use of labour.

That small-scale irrigation makes economic sense is confirmed by the vitality of the private sector in such areas as the Wabi Shabelle River and the Mandera Triangle. It is estimated that only 2.4% of irrigable land is under irrigation in the Somali Region of Ethiopia, of which about 70% is under 'traditional' irrigation technologies such as spate irrigation, controlled or uncontrolled flooding, lift irrigation using buckets and gravity-fed canals.

In Kenya, a strong demand for horticultural products (including exports) is driving a 'new frontier' in small-scale irrigation, based on the use of low-cost technologies, wholly or partly made in the country. The technologies include rainwater harvesting, bucket irrigation, gravity fed sprinkler and drip, treadle and pedal pumps, rope and washer, motorised pumps, wind power and small earth

¹³⁰ You *et al.* (2011); Headey *et al.* (2011)

¹³¹ Sandford, S. (2013) Pastoralists and irrigation in the Horn of Africa. Time for a rethink? In: Catley, A., Lind, J., & Scoones, I., Pastoralism and development in Africa. Dynamic change at the margins. Earthscan, 47-56

¹³² Sandford, *ibid.*

dams.¹³³ Small-scale irrigation uses an estimated 50,000 ha; the total irrigated area is 80,000 ha of a potential area of more than 300,000 ha. The Ministry of Agriculture has a target of 1.2 million acres over 5 years¹³⁴

Significantly, small-scale irrigators in Kenya raise their own capital from private savings, attracted by good profits. Compared with farm incomes from rainfed land, which average less than US\$750/ha, irrigated land can produce 2-3 crops a year worth US\$1,400 (snow peas, French beans), US\$450 (kale) or US\$600 (onions). Such opportunism among farmers is not new and accords with the findings of local district studies in semi-arid Machakos and Makueni Districts.¹³⁵ (It may be noted that the Akamba men folk were themselves semi-mobile pastoralists before the colonial period: farming (hand-hoed shifting cultivation) was for women.)

Very little attention is given in macro-scale planning proposals to the legion of issues surrounding small-scale farmers' participation in irrigation schemes. Studies at the project level are infrequent. One exception, a study of crop farming along the Wabe Shebelle River in the Somali Regional State, investigated three of some 18 'asset building groups' that were set up in an earlier project.¹³⁶ Each had about 50 farmers with shared pumps. From an examination of scheme performance and intended or actual benefits, it was concluded (disappointingly) that, when compared with pastoralism, small-scale irrigation may not remove risk. Beneficiaries had reverted to individualised operations and preferred the indigenous land sharing and pump renting agreements. Instead of helping destitute widows, the scheme was supporting experienced irrigators who had benefited from earlier projects. A great many technical issues were found to impact on performance. Diversity of situations, and weak 'ownership', indicate that irrigation should be planned on a case-by-case basis and with full stakeholder participation from design to implementation.

Given such complexity, it is unlikely that small-scale irrigation can be effectively expanded by a blue-print at a macro-scale. A guide to planning and managing small-scale irrigation schemes has been provided by FARM-Africa.¹³⁷

But where interventions fail, private enterprise seems to flourish. In some major river valleys of the Somali Region, irrigation is already considered to exploit most of the potentially irrigable land, based on small holdings, diesel pumps, hand labour and sub-optimal fertilizer treatments - on a 'low input - low output' basis.¹³⁸ Pastoralists are said to be driven into farming by their declining livestock holdings and by shortages of grazing land. They tend to accord low status to farming. The labour requirements of year-round irrigated farming are not compatible with the needs of mobile pastoralism, except for large families. But many Somalis, nevertheless, have recently negotiated access to irrigable land and water adjacent to the pre-existing schemes on the Shebelle River, and

¹³³ Purcell R. (nd), Potential for small-scale irrigation in sub-Saharan Africa: the Kenyan example. FAO and The World Bank; Avery S.T. (2010), Coastal Rural Support Programme, Water Master Plan Study. Aga Khan Foundation

¹³⁴ Daily Nation, Saturday 8th June

¹³⁵ Tiffen M *et al.*, (1994), *op.cit.*; Gichuki F.N. (2000), *op.cit.*

¹³⁶ USAID/ Feinstein International Center, Tufts University (2010), Impact assessment of small-scale pump irrigation in the Somali Region of Ethiopia

¹³⁷ Carter R. & Danert K. (2006), FARM-Africa Ethiopia: planning for small-scale irrigation intervention. Working Paper series 4, FARM-Africa

¹³⁸ Devereux S., *Ibid.* AWG (nd), Irrigated and rain-fed farming in Somali Regional State, Ethiopia: lessons learnt. Agricultural Working Group

the privatization of land for irrigation has led to disputes.¹³⁹ Its rising value also attracts speculators and entrepreneurs from the towns. The cultivated area in the State increased threefold between 1973 and 2010. Security of land tenure is an urgent issue for (ex-) pastoralists, many of whom do not expect to return to mobile pastoralism.

Crop agriculture, to reduce vulnerability to drought, must be rooted in sustainable resource management and generate a level of production that satisfies the material and social needs of each family. Sedentarization automatically extends the pastoralist's agenda from livestock into farming, education, health and market access for income diversification. Two schemes for Kereyu agro-pastoralists in Fentale (in the Awash River basin, Ethiopia) make use of irrigation water on the margins of the Metehara sugar plantation.¹⁴⁰ They accommodate 6-700 beneficiaries on land, formerly communal rangeland, allocated by the elders at 0.75 ha for a family. While their diminishing herds are grazed collectively on rangeland at two days' distance, the communities occupy new housing in settlements with a school, administration and unsurfaced road to market (at about 15 km). New income streams and especially the ability to sell two or three crops at different times of the year are seen as advantages. However, an annual fee is payable to offset the capital costs of the schemes. Besides the management of land and water resources (managed by water users' associations), issues of market demand and linkages (motor transport for produce), fertilization (cost), technology (scarcity of capital funds), education (inability to sustain children's registration beyond primary level), health, and income diversification are concerns. Staff and skill shortages have affected efficiency.¹⁴¹ Poverty still means a lack or shortage of livestock, but while irrigated farming has reduced the risk of food insecurity, the inability to acquire additional irrigable land has raised fears for the next generation, while the scope for income diversification is constrained by education and travel costs.

Schemes can also be adversely affected by power shifts and conflict. Pastoralists displaced by the Shifta rebellion in the 1960s took up irrigation in the Tana flood plain with government support, but when this was removed, the farms languished until renewed support was forthcoming. Many used farm incomes for re-stocking and went back to mobile pastoralism. The crucial difference was and still is marketing access and costs.¹⁴² According to informants, sustainable irrigated cropping in the Garissa area depends on the removal of compulsory payments to the scheme revolving fund, better transport to market, resolving the competition for labour between farming and herding, giving equal opportunities to women (whose participation in farming is crucial), ending the inefficient under-use of field holdings, and improving efficiency and equity in water management.

Small-scale irrigation is not yet a panacea for the problems faced by pastoralism. But the values of snow beans, French beans, kale and onions in Kenyan markets (quoted above) illustrate increasingly buoyant markets, and the 'boom' in small-scale irrigation where urban markets are within reach, suggest positive trends in contrast to the negatives of the "pastoralists' dilemma". However small-scale irrigators may compute their business strategies (for example, by undervaluing family labour), the widespread success of farmers in gaining access to growing fruit and

¹³⁹ Gomes N. (2006), Access to water, pastoral resource management and pastoralists' livelihoods. Rome: Livelihood Support Programme, FAO

¹⁴⁰ Akloweg, N (2013) Notes from the field visit made to the irrigation schemes in Fentale Woreda, 28 January, 2013

¹⁴¹ Flintan, F., *ibid.*

¹⁴² Farah K.O., Nyariki D.M., Noor A.A., Ngugi R.K. & Musinba N.K. (2003) The socio-economic and ecological impacts of small-scale irrigation schemes on pastoralists and drylands in Northern Kenya. *J.Soc.Sci* 7/4: 267-274

vegetable markets should eventually open the door to agro-pastoralists in more remote places. Even in a remote place - such as the Mander triangle on the borders of Kenya, Ethiopia and Somalia - irrigated fodder production for the market - which is the local trans-border traffic in livestock - is increasing incomes, if not necessarily those of the poorest.¹⁴³ Success also depends on maintaining water and seed supplies.¹⁴⁴

Irrigation schemes need capital. Cost recovery problems have shadowed small-scale irrigation schemes supported by external donors or the government, with top-down management and unpopular land alienation. New models of capitalization are required. Experiments in new financial and management packages have begun to yield lessons in Kenya.¹⁴⁵ A public-private partnership (PPP) leases common or community trust land and shares capital costs between private investors and local farmers. A company manages the scheme. As profits accumulate, the leased plots are taken over by small-scale farmers, so the land stays with the community. Other innovative financial packages have been developed and experimented in Kenya.¹⁴⁶

Private investors may have local connections and be prepared to abandon profit maximization in favour of the social rewards of philanthropy. 'Impact investments' which aim at social as well as economic benefits - for reasons other than profit maximization - are gaining ground as a new class of financial assets.¹⁴⁷ If the ASALs are to achieve economic parity with more humid zones, new opportunities for investment are required.¹⁴⁸ This thrust has been underlined in a recent report on global drylands.¹⁴⁹

However, two caveats are in order.¹⁵⁰ The first is that small-scale irrigation is necessarily located as close as possible to the water source. But in Kenya, where riverbank flood recession farming is traditional, cultivation disturbs soils and increases erosion, and the Water Act forbids 'tillage' within the riparian zone. The implications of water legislation are unclear, since it appears to be widely disregarded.

The second caveat is that conflicts may arise where schemes are set up in the territories of wildlife populations. Damage may be caused, crop losses incurred, and fencing is prohibitively costly to smallholders.

Critical factors in the success of small-scale rainfed or irrigated agriculture include:

- secure rights of access to land
- high value and innovative crops
- integrated livestock enterprise
- infrastructure in place
- accessible markets

¹⁴³ ELMT (2009) Technical Brief. Fodder production: experiences and lessons learnt by VSF Suisse; Seif Maloo, *Pers.com.*; ELMT RCU (2009), Monitoring Visit Reports for VSF Suisse: Mander and Garbatulla

¹⁴⁴ ELMT RCU Monitoring Visit Reports for CARE Somalia: DCFS, Dollo

¹⁴⁵ Gichuki, F.N., *pers.com.*

¹⁴⁶ Grimm, J. & Richter, M. (n.d.), Financing small-scale irrigation in sub-Saharan Africa. Part 2: Country Case Study Kenya. GTZ/ The World Bank

¹⁴⁷ J.P.Morgan (2010), Impact investments: an emerging asset class.

¹⁴⁸ Pipal Ltd. (2011), Northern Kenya Investment Fund Overview Report. Pipal Ltd Nairobi

¹⁴⁹ EMG (2011), Global drylands: a UN system-wide response. UN Environment Management Group Nairobi: UNEP

¹⁵⁰ Avery, S.T. (2010), *ibid.*; (2012), *ibid.*; *Pers.com.*

- water harvesting, efficient management
- well-designed gravity systems¹⁵¹

4.2 Option B - Continued support to pastoralism

Many interventions have aimed to ‘modernize’ the livestock sector, based on ideas of a culturally driven, unproductive, ecologically damaging and inefficient system. These ideas have been called into question by research. There are now three main reasons why mobile pastoralism must continue in some form:

1. The livestock sectors of these countries make a substantial contribution to agricultural GDP (15% in Ethiopia, for example), and contribute significant export earnings to national economies. This contribution is growing, as demand for meat and other livestock products increases (the ‘livestock revolution’) with urbanization, growing numbers of better-off people, and global trade.
2. It presently supports a large population 30 million in the Greater Horn of Africa¹⁵²; in the Horn of Africa countries. These populations have entitlements under the Millennium Development Goals, and failure to achieve the MDGs for their pastoral populations will prejudice these countries’ achievement at national level.
3. Mobile pastoralism has been shown to be an economically efficient production system in arid and semi-arid, highly variable (both temporally and spatially), and low productive ecosystems. Unless distorted by appropriation of rangelands by other sectors, it is ecologically sustainable at appropriate stocking levels and can be combined with another major income earner: tourism, which is largely concentrated in the drylands of these countries.

In order to evaluate the economic benefits of mobile pastoralism, free from presumptions, a recent study has offered a comparison of the returns to pastoralism with those to large-scale irrigated cotton and sugar plantations in the Awash valley of Ethiopia.¹⁵³ This uses two scenarios (low and high) for stocking rates, and estimates of total primary production on riverine rangeland, together with research-based assumptions of species composition, and the age and sex structure of the herds, to compute numbers of tropical livestock units (TLUs). The number of livestock and of breeding females (per ha) and milk produced for human consumption are computed, and values assigned to other livestock products. Factoring in the husbandry costs (which include weapons for self- and herd protection), estimates are made of net returns to one ha of riverine land under seasonal pastoral use.

An economic analysis of data on cotton and sugar production was then carried out to produce estimates of net returns per ha. The conclusion of the analysis is that livestock production is more profitable per ha than estate cotton production, and this finding is supported by evidence of declining interest in large-scale production of cotton in Ethiopia. Using the world price for sugar cane (as no raw cane sugar is sold locally), it is shown that cane sugar too is less profitable than pastoralism. The estate factory processes sugar cane and this added value makes the enterprise

¹⁵¹ Economic/financial group, ILRI Workshop on the Appropriateness of Crop Agriculture, February 6, 2013

¹⁵² CAADP Policy Brief No.6, March 2012

¹⁵³ Behnke R. & Kerven C. (2013) Counting the costs: replacing pastoralism with irrigated agriculture in the Awash Valley, North-eastern Ethiopia. Climate Change Working Paper 4, London: IIED

profitable. However even processed cane sugar struggles to exceed in value that of pastoralism - in only two years since 2002 has it exceeded it. The fixed capital costs (infrastructure included) were not factored into the estimation. The findings imply that the economic rationale for switching rangeland (even rich riverine rangeland) to irrigated sugar production must lie elsewhere than in increases in economic returns per ha. Ethiopia (as noted above) plans to invest large resources in irrigated sugar producing schemes.

It cannot be assumed that small-scale irrigation is also less profitable than pastoralism. Such rationales must be sought in the livelihood strategies of agro-pastoral families whose poverty is a major determinant. A reported tendency for small-scale, ex-pastoral irrigators in Wabe Shebelle (Ethiopia) and Garissa (Kenya) to use the profits of farming to finance restocking suggests that under present conditions, irrigation (of any marketable crop) may still be seen as a second-best option to pastoralism - a means to an end rather than an end in itself. But does this indicate a cultural preference rather than a rational choice? Or does it reflect the insurance value of savings invested in livestock rather than a desire to return to mobile pastoralist way of life?

These considerations call for the interests of pastoralists to be taken seriously by central governments pursuing macro-economic targets. Swift sedentarization is unlikely to happen. Ethiopia's Pastoral Community Development Project (PCDP Phase 1, 2004-2009) aimed to build capacity, deliver services, invest and reduce vulnerability of 450,000 households in the pastoral zone. Its three components were: sustainable livelihood enhancement, pastoral risk management, and policy reform. The project assessment found positive impact indicators but also some shortcomings, which are being addressed in Phase 2 (from 2009).¹⁵⁴

There are many ways of strengthening mobile pastoralism as a production system. Some of the pathways that can lead to a more productive and sustainable pastoral sector are analyzed in Table 4.3 below:

Table 4:3 SWOC analysis of pastoral development strategies¹⁵⁵

Strategy	Strengths	Weaknesses	Opportunities	Constraints
Breeding improvement	productivity gains	greater vulnerability to drought or disease <i>risk of reduced performance</i>	increased income <i>more productive breeding stock</i>	poor access to markets

¹⁵⁴ Ethiopia: Pastoral Community Development Project. Project Completion Digests - 2011; Proposed loan and grant to the Federal Democratic Republic of Ethiopia for the Pastoral Community Development Project II (EB 2009/97/R.16/Rev.1)

¹⁵⁵ Partly based on Njoka, J. T., *ibid.*

Strategy	Strengths	Weaknesses	Opportunities	Constraints
Animal health	animal longevity <i>reduced mortality</i>	none	increased income <i>breeding potential</i> cross-border collaboration <i>establish disease-free zones</i>	poor access to veterinary services
Rangeland and water improvement	increased carrying capacity <i>rangeland sustainability</i> water harvesting, conservation, management	risk of reduced ecosystem resilience <i>risk of over-exploitation of groundwater</i>	larger herds, less mobility necessary	<i>high costs, low productivity</i> shortage of proven species and need to strengthen local management capacities
Fodder banks	forage supply in dry season/ droughts	must be grown by sedentary farmers <i>can only provide feed in critical times or for few stock too costly for poor?</i>	reduced weight loss in drought	prices of fodder
Insurance	financial smoothing of seasonal variability	co-variant regional losses <i>dependence on government or donor support</i>	weather index-linked insurance and private sector participation possible	profitability uncertain
Marketing support	increased producer access to markets (local and export) <i>enhanced incomes from livestock products</i>	none	increased market participation <i>reduced dependence on subsistence function</i> benefits of the 'livestock revolution' <i>strengthened institutions</i>	legal and institutional barriers <i>illegal rent-seeking</i> excessive middlemen <i>transport of live animals</i> inadequate cold storage of animal products

Strategy	Strengths	Weaknesses	Opportunities	Constraints
Trade regulation	regional common market <i>increased share of income to producers</i> standards ensure good prices	dependence on negotiated and harmonised interstate regulations	upgraded livestock sector benefitting pastoralists	conflict, especially in borderlands
Land tenure reform	provide security of grazing rights <i>negotiation of NR access at community level</i>	rights contested by farmers must be guarded <i>in absentia</i>	investments in pasture improvement	power asymmetry between pastoralists, farmers, corporations and government
Creation of New institutions	secure mobility through agreements	conflict must be avoided	creation of rights and access framework respected by all	government participation essential

Mobile pastoral systems may nevertheless continue to suffer from high risk, low food security, poor service provision (extension, education and health), and remoteness from markets for much of the year. Insecure land tenure calls for urgent reform in order to resolve conflicts of interest between pastoralists and corporate farming on the one hand and between pastoralists and small-scale irrigators on the other. In Kenya the Land Commission has been formed and will regularize the payment of rent to customary owners who have established claims to the rangeland.¹⁵⁶ But pastoral systems are better adapted than alternative systems to risk, drought and climate change. Maasai in Kenya, under pressure from increased cattle mortality, adjust continuously to a changing resource base, changing their grazing circuits, making new agreements with farmers, rebuilding herds and accessing markets.¹⁵⁷ Innovative engagement with markets is also reported among the Afar in Ethiopia.¹⁵⁸

The key to success with improving pastoral sector performance is the retention of the essentials of the existing system rather than its transformation according to a different model. Pastoralists, like dryland farmers, need space in which to adapt, according to individual or family circumstances, to the opportunities open to them. Adaptive capacity tends to correlate with wealth; thus economic differentiation is reported to be increasing as larger herds, motor transport, electronic communications and commercial service provision favour the better off. Adaptive capacity is directly linked to mobility. In the West African Sahel, policies to promote sedentary livestock farming failed, and new approaches emphasize dialogue and negotiation, which take account of

¹⁵⁶ Allport, R., *pers.com*

¹⁵⁷ Letai, J. & Lind, J. (2013) Squeezed from all sides: changing resource tenure and pastoralist innovation on the Laikipia Plateau, Kenya. In: Catley, A., Lind, J., & Scoones, I., Pastoralism and development in Africa. Dynamic Change at the Margins. Earthscan,

¹⁵⁸ Davies, J., *ibid.*

the diversity and constraints in resource management, the role of local land institutions and the need for sustainable financial mechanisms.¹⁵⁹

Adaptation is at the heart of disaster risk reduction. Doubts are frequently cast on the capacity of pastoralists' inherited adaptive strategies to manage increased stress under current and future conditions. On the other hand, significant progress has been made by some NGOs to enhance these capacities, for example through Community Managed Disaster Risk reduction (CMDRR).¹⁶⁰ A role for financial institutions in providing resilience has been recognized in the form of village community banking.¹⁶¹

However, the conclusion with respect to the policy option of continuing and revitalizing pastoralism is already accepted by most observers: that is, given increasing human populations, diminution in the numbers of livestock *per capita*, and reducing rangelands accessible to pastoral communities, even when setting aside the vexed question of land degradation, a major shift from pastoralism to other economic activities will be necessary in the long term.¹⁶² The case for pastoralism is increasingly that for the livestock sector as a whole: meeting domestic and foreign demand for meat and other livestock products as the global 'livestock revolution' continues. A future for the livestock sector should not be in doubt, but the nature and role of mobility and of the family may have to change in the process. Also, the role of livestock as assets (or the urge to re-stock at all costs) shows no sign of diminishing.

4.3 Option C - Livelihood diversification

This is the third option for development support. Opportunistic livelihood diversification has two main justifications:

1. as a risk-spreading strategy under conditions of uncertainty; and
2. as a 'safety net' for households or individuals that are not viable for any reason (e.g. loss of herds beyond immediate possibility of re-stocking; loss of human resources of labour/ skills owing to mortality; chronic sickness; or reproductive failure - not enough sons).

Because of the interconnections in social and biological systems in drylands, it is necessary to take them into account along with crop agriculture and pastoralism.

The availability of private capital is quite different: in (1) the entry or access costs of a new income can be met by selling animals if necessary; while in (2) an absence of financial capital restricts choice to minimum-cost and usually low-income options. However this is not a categorization of strategies but of intent (one person's opportunity may be another's last resort).

Where realized income allows it, re-stocking takes place, maybe followed by a return to mobile pastoralism, or (as in West Africa) by 'absentee pastoralism' whereby animals belonging to a

¹⁵⁹ Deygout, P, Treboux, M., & Bonnet, B. (2012) Sustainable production systems in dry areas. Which objectives for development cooperation? Institute of Research and Application of Development Methods, [French] Ministry of Foreign and European Affairs and French Development Agency 167-176

¹⁶⁰ Abdi, S. (2011), Technical Brief: Community Managed Disaster Risk reduction (CMDRR) - Cordaid's strategy for building resilient communities in dryland areas of East and the Horn of Africa. Cordaid/ REGLAP; Haverkort, T. & Hulofo, H. (2011), Good Practice Principles: Community Managed Disaster Risk Reduction (CMDRR) in the drylands of the Horn of Africa. REGLAP

¹⁶¹ Kaberia, D. & Allport, R. (2011), Good Practice Principles: Village Community Banking (VICOPA) and Village Savings and Loans Associations (VSLAS) in the drylands of the Horn of Africa. FAO/ Care/ REGLAP

¹⁶² Sandford, S., *op. cit.*

sedentary townsman are grazed, managed and even bred under contract by paid herdsmen. Some common or significant strategies are shown in Table 4.4 below.

Table 4.4: SWOC analysis of income diversification options

Strategy	Strengths	Weaknesses	Opportunities	Constraints
harvest and sell ecosystem products (e.g., food, fibre, medicines)	local availability <i>diversity</i> zero entry costs	over-exploitation in response to demand	open to disadvantaged - elderly, women, children	low income in relation to time spent <i>fewer useful spp. in grassland seasonality</i>
rural manufactures (e.g. mats, rope, baskets, carvings)	raw materials locally available	over-exploitation in response to demand	non-crop market participation	competition with herding for time
woodlots, tree planting/protection (e.g. fruit or shade trees)	income from timber, fuelwood, NTFPs	low germination <i>slow maturation</i>	woody ecosystem benefits	lack of title to land <i>aridity</i> woodcutters
service provision (e.g. building, food selling, herding, tailoring, retailing)	assured local market <i>diverse opportunities</i> flexible timing	some entry costs <i>skills necessary</i>	retention of income within community	small market locally
carbon markets (PES)	zero entry costs (?) <i>income from non-cropland</i>	benefits more likely for better-off <i>high administration costs</i>	north-south funding for sustainable ecosystems	low capture rates on rangeland <i>lack of title to land</i> mobility
tourism	high financial yield <i>employment</i>	high capital requirements <i>seasonality</i>	local ownership of tourist assets	global or local 'geopolitical risk' <i>external control</i>

Strategy	Strengths	Weaknesses	Opportunities	Constraints
migrant labour in towns, on commercial farms, in government employment)	remittances and investment capital <i>compatibility with seasonal agriculture</i>	entry costs (travel, food etc.) <i>insecure employment</i> exposure to risk or conflict	access to urban incomes to support consumption, re-stocking, goods <i>use of social networks</i>	unavailability of herding labour
livestock and product trading (e.g. camels, cattle, small ruminants, equines, fowls, meat, milk, hides)	value chain for own bred animals <i>high profits</i>	high capital costs <i>disease risks to animals</i> slow (on foot) or costly (truck)	wealth for re-stocking - year on year accumulation	prolonged removal of herding labour
secondary/tertiary education	possible access to salaried employment (though deferred)	high costs	widened life chances - world is your oyster <i>reduced pastoralist marginalisation</i>	prolonged removal of herding labour

These (and other) income diversification strategies suggest some pathways for development agencies. The distinctions are important. Livelihood diversification is not an amorphous economic ‘sector’ but a very case-specific arena where aims, design, methods, and benefits of interventions may be diverse and not amenable to generalized policy or action. Many strategies are carried on within the so-called ‘informal sector’ outside regular employment and institutional frameworks. Traditionally ignored by governments, diversified income streams add to the well-being of households. Although apparently geographically isolated and ‘remote’, an impressively large proportion of mobile pastoralists capture or try to capture such income streams, as shown in livelihood research in the Somali region of Ethiopia.¹⁶³

Ecosystem services (additional to those used for agriculture and grazing) increase in value as they become scarce through exploitation. There is plenty of evidence of their perceived value to local communities and the role of indigenous or local knowledge in their conservation.¹⁶⁴ However, development practice was slow to recognise this perspective, until highlighted by the Millennium Ecosystem Assessment.¹⁶⁵

¹⁶³ Devereux S. (2006) *op.cit.*

¹⁶⁴ Silvestri, S, Zaibet, L, Siad, M.Y, Kifugo, S.C. (2013) Valuing ecosystem services for conservation and development purposes: a case study from Kenya. *Environmental Science and Policy*, 31-33; IUCN (2009)

¹⁶⁵ World Resources Institute (2005) Millennium Ecosystem Assessment. Washington DC, WRI

The incorporation of diversification strategies, to an increasing degree, in pastoral livelihoods, even in combination with a high level of mobility, is an Africa-wide trend. To ignore it in sectoral development policies is to risk discrepancy between policies and their intended beneficiaries. The case for diversification is essentially the nature and extent of vulnerability among pastoralist populations.¹⁶⁶ Potential labour absorption in irrigation is limited by hydrological constraints and that of large-scale rain-fed farming by investment and agro-ecological constraints. However, movement between different regions of large numbers of unqualified labour migrants may provoke ethnic tension or conflict.

Education emerges as a cross-cutting intervention which can be the pillar of diversification strategies. There is evidence of an increasing priority being placed on it, not only by policy makers but also by pastoralists. For example, an agro-pastoral family (no longer mobile) interviewed in Fentale (in the Awash valley, Ethiopia) used the profits of micro-irrigation (provided by an IFAD cost-recovery scheme) to place children in a new primary school. Dispersed pastoral education can accommodate to herding and farming demands; models exist and there are many years of experience to draw on.¹⁶⁷ But proceeding to the next level of schooling would mean finding money for transport and boarding the scholars in the town, as well as removing them from farming or herding tasks for much of the time. Regretfully these children were later withdrawn. Yet they face unemployment in the future, and the family holdings of animals and irrigated land are too small to be subdivided. The project has bought some time, but the future remains uncertain.

This micro-scale example can be compared with the findings of macro-scale research which shows clear historic association between education (with other social investments) and indicators of national economic development.¹⁶⁸ However educational provision is not the end of the story. Employment links the micro with the macro scales. Pastoral peoples are increasingly incorporated into processes of economic growth, urbanization, migration and the informal sector. Wisely they are reluctant to abandon their agrarian roots, as has been reported in some parts of Africa,¹⁶⁹ though for some this may be the unavoidable outcome of a total loss of herds. Irrigation (where it is technically possible) can provide some insurance, in the form of assets and income, against uncertainty. In evaluating alternative interventions for the pastoral peoples of the Horn of Africa, development agencies should seek in-depth understanding of the role and opportunities of education. Within the region, though not for mobile pastoralists, longitudinal tracking of change among Akamba farmers has exposed enduring symbioses between educational aspiration, employment outside the district, and investment in farm productivity and environmental conservation.¹⁷⁰

¹⁶⁶ Headey, D., Alameyehu Seyoum Tefesse, You Liangzhi (2013) Diversification and development in pastoralist Ethiopia. Submitted for publication

¹⁶⁷ Kratli, S. & Dyer, C. (2009), Mobile pastoralists and education: strategic options. Education for Nomads Working Paper 1. London: IIED

¹⁶⁸ Mehrotra, S. and Delamonica, E. (2007), Eliminating human poverty. Macroeconomic and social policies for equitable growth. London: Zed Books

¹⁶⁹ Bryceson, D., Kay, C. and Mooij, J. (eds.) (2000) Disappearing peasantries? Rural labour in Africa, Asia and Latin America. London: Intermediate Technology Publications

¹⁷⁰ Tiffen, M., Mortimore, M. and Gichuki, F., *op. cit.*

5. Selecting a strategy

5.1. Resilience via development

In Section 1 of this Report, a case was made for an integrated understanding that includes all of the components of development and all the processes of interactive change. This holistic approach has been formalised in a theory of complex system change in drylands, known as the Dryland Development Paradigm. To understand the interactions better, it may be divided into two co-evolving spheres, the human system and the environmental (eco-) system, whose interactions describe the status, direction and sustainability of natural resource management on the one hand and, on the other hand, the drivers, intensifiers and persistence of the human systems.

Each of the three development options (crop agriculture, mobile pastoralism and income diversification) are embedded in the human-environment system. Policies for the development of drylands in the Horn of Africa should therefore integrate strategies for crop agriculture, pastoralism and income diversification. This is not straightforward because of the traditional professional division of modern governments and the specialization of cadres within that structure. It is at this level that interventions are planned and carried out. Ironically, when the professional meets the people at the grass roots, he or she may encounter a broader perception of the whole system than his/her own. Local leaders born and bred in the area have grown into a local knowledge community unencumbered with professional bias.

Adaptation is a key process in drylands, an organizing principle for using local knowledge to readjust livelihoods and to make appropriate choices in the face of change, whether in the human system (e.g. prices of a staple commodity) or the environmental (e.g., more frequent droughts). Since it affects many variables, is continuous and tends to be irreversible, when it works it can be described as development. However, mal-adaptation is also possible, having a negative effect on change. For example, responding to falling agricultural yields by cultivating steep and erodible slopes can lead to worsening of the situation for both land and livelihood.

For present purposes, therefore, adaptive capacity building for greater resilience is taken as synonymous with development; and any 'development' that does not strengthen resilience is excluded.

5.2 Triangle of priorities

The three points of the triangle (options) are 'crop agriculture', 'pastoralism', and 'income diversification'. The first is subdivided into four options: large-scale rainfed, small-scale rain-fed, large-scale irrigated and small-scale irrigated. The ToR of this study were based on a prioritization of crop agriculture, and an implicit prioritization of small-scale irrigation (SSI).

We do not know to what extent the capacity of pastoralism to support additional livestock and livelihoods can be expanded. Sandford claims that the livestock population is already too small, which renders the question academic.¹⁷¹ Meanwhile, others propose various interventions and policy priorities (such as the reform of land tenure).¹⁷² However, according to Sandford, past

¹⁷¹ Sandford, S. (2011) Pastoralists and irrigation in the Horn of Africa: time for a rethink? Paper presented at the International Conference on the future of pastoralism. University of Sussex and Feinstein International Center of Tufts University

¹⁷² Njoka, J. *ibid.*

interventions have been ‘widely reported as disastrous’, for a number of reasons: technical deficiencies, economic failure, infectious disease, labour incompatibility, values incompatible with farming, physical incapacity, environmental effects and insecure tenure. All these, perhaps, should count for little against the overwhelming need of more livelihoods for more pastoral or ex-pastoral households.

Neither can income diversification fill the gap. Without education, young pastoralists (mostly male) cannot obtain stable employment and wages. Moreover, migration takes them away from the farm or the herd. Only a tiny minority have obtained secondary education or succeeded in gaining a foothold in the urban economy. So we are driven back to SSI, which alone (given the current expansion of markets for irrigated commodities), appears to be large enough in scale, and expanding. But without answers to the deep-seated causes of failure listed above, this absorptive capacity remains theoretical.

5.2.1 Small-scale irrigation

As we have observed earlier, the strongest argument in favour of promoting a new class of ‘agro-pastoral irrigators’ is the existence of spontaneous uptake of irrigation, using private capital, in riverine locations such as the Mander Triangle and the Wabi Shabelle. Most of the literature is about ‘schemes’ financed from outside. More is needed on spontaneous initiatives where solutions have been found even to the land tenure problem (in the form of farmer-herder agreements). Also, new ways of mobilizing finance are being tried (see Section 4).

An argument from analogy can be constructed from the history of land and water conservation in Ukambani around Machakos in Kenya.¹⁷³ For more than four decades, conservation in the form of earth terraces was promoted in this Reserve by coercion, extension, and incentives. It was famous for its eroded landscapes, deforested slopes and disinterested farmers, themselves ex-pastoralists. Despite significant uptake by the 1950s (known as the ‘Machakos miracle’), independence in 1964 removed colonial rule, which was associated in peoples’ minds with repressive enforcement of soil conservation, and resulted in widespread abandonment of the structures. However, a decade later, yield differences between terraced and unterraced land were attracting increasing attention, because of better water retention. By this time, the context had changed from cattle herding with subsistence maize to far more profitable coffee farming, fruit and vegetable production, with urbanization, education and migrant remittances or investments. Aided, but by no means dependent on development projects (notably the Machakos Integrated Development Programme, 1978-84), some locations had terraced 100% of their land by 1978.

It may be that the SSI system is poised for a similar transformation, with proven technologies, ever-growing urban markets, export markets, improving market infrastructure (assisted by mobile phones), and the beginning of an expansion of education. As for ‘traditional values’ - these do not appear to stand in the way of spontaneous SSI smallholdings.

The scale of irrigation development is large, though, according to optimistic estimates of potential, the process may still have a long way to go. Large scale irrigation has a high degree of dependency on public sector finance, global markets (e.g., cotton and sugar), outside expertise and technology transfer. The markets are likely to continue to grow. On the other hand, SSI is flexible enough to

¹⁷³ Tiffen, M., Mortimore, M. & Gichuki, F. (1994), *ibid*.

make use of private capital (Public-Private Partnerships or family savings), local know-how and access to local and regional markets. The role of policy is to facilitate good practice - in husbandry, soil and water conservation, and marketing. Irrigation permits several crops to be harvested each year, and intensive farming of high value crops (if inputs are affordable), farmer experimentation and innovation.

5.2.2 Income diversification

Urbanization, informal sector employment and migration are increasing in the Horn of Africa, and will continue to do so, though doubts are expressed concerning labour absorptive capacities. However, these trends are difficult to predict. Income diversification in rural households is driven by large families, small herds, insufficient land and the fear that subdivision will make livestock-based farming non-viable. Feedback loops may link primary production with off-farm incomes, including the funding of micro-investments. Increasing demand for education as an income diversifying strategy is evident among mobile pastoralists as well as agro-pastoralists, who are willing to pay for it (if they can). However, employment opportunities do not fully match the numbers of school graduates and the unsuccessful may end up back on the farm. Positive linkages between education and other social services provision on the one hand and indicators of human development on the other are available from some other countries. Regardless of the government's capacity to 'provide employment', the hypothesis is widely accepted that an educated person is better able, through wider opportunities, to achieve self-improvement than one who is not.

5.2.3 Mobile pastoralism

Continuation of pastoralism in some form is too important to be made a hostage to fortune through neglect or through untried policy changes. The importance of the livestock sector in national economies coincides with the global 'livestock revolution'. Export markets in the Middle East are booming for Ethiopia, Somalia and Kenya. Live animals can be taken to the coast, shipped and marketed by road, sea and even air. The arid and semi-arid rangelands on which they are fattened are undergoing a perceptual transformation from 'wastelands' to national assets. Existing breeding and grazing systems can be improved in quality or productivity (e.g., by controlled grazing and seasonal use of reserve grazing, where there is security of tenure), and are generally efficient ways of using the productivity of variable rangeland ecosystems. That is, if herds can be moved without restriction in response to variable pasture conditions. But restrictions on movement, in the form of appropriation by outsiders, privatized enclosures by other pastoralists, wild life or forest reserves, urban and other forms of building development, or land degradation (for example, invasion by the noxious weed *Prosopis juliflora*), threaten the integrity and biological productivity of the range.

The costs of inaction or of over-reaction are both unacceptable. Inaction will not protect the rangeland ecosystems from private appropriation or degradation, leaving a growing human population with less and less productive range, smaller herds and intensifying food insecurity, thereby increasing their dependency on, and costs of food aid. Transformative over-reaction, introduced by outsiders, will increase the risk of ecological damage.

To conclude, all three options in the triangle must be pursued concurrently for two reasons: first, the size of the challenge is such that all available resources must be employed; and second,

because the options are connected and interact, calling for maximum flexibility to accommodate adaptive responses, at every level from households to governments.

5.3 Good practice in promoting small-scale irrigation

Arid and semi-arid regions of the Horn of Africa present a major challenge to all development partners - regional, national, sub-national, community, private sector, donors and NGOs. At its most general level, the challenge can be posed as one of managing a dynamic relationship between growing populations (human and animal), reducing poverty, and sustaining natural resources. No resource can be discarded (as used to be implied in the term 'wastelands'). Neither can potentials be allowed to stagnate under inefficient or destructive management. Although these resources are limited in extent, mostly low in biological productivity, and subject to climatic variability, their use must be intensified. Intensification (e.g., through irrigation) is already observable and will accelerate in future.

The largest gap between future potential and present achievement is in irrigable land within reach of rivers and markets, and this truth is reflected in the pace of public sector and small-scale initiatives. Irrigation has potentially harmful side-effects as well as positive potentials. But given the need to intensify natural resource management, and the fact that technologies and strategies for dealing with harmful side-effects are known, increasing the quantity and productivity of irrigation development is inevitable. In short, the drylands cannot make do without the wetlands.

Good practice in irrigation development should include the following principles:¹⁷⁴

In prioritization, planning, design, implementation, and sustainability: land use plans should reconcile competing claims and guide both the planning of large-scale schemes and the release of titles to small-scale irrigators. As implied above, this is a governance and policy issue, requiring open stakeholder negotiations and legally enforceable outcomes, rather than a merely technical matter. Several NGOs have developed models and accumulated experience for use at the local level. The challenge is to up-scale democratic principles in land use planning.¹⁷⁵ Open governance, bottom-up development, community participation, and local ownership must be transformed from rhetoric to practice.

Freedom of choice in matters relating to household livelihood strategies: irrigated smallholdings usually form only one element in household livelihoods which (given the context) feature livestock, rain-fed farming, and off-farm incomes, whether local (e.g., charcoal making) or distant (involving migration elsewhere). A narrowly sectoral approach to irrigated farming can run into trouble where such system-wide linkages are ignored.

Recognizing and realizing the complementary benefits of livestock: using crop residues and rotating main crop harvesting throughout the year, the Gezira scheme in Sudan supports twice as many livestock as it did before irrigation. In northern Nigeria, the density of livestock is negatively correlated with the availability of rangeland (i.e., positively correlated with residue supply from intensively cultivated cropland). Some agro-pastoralists may succeed in building herds to a point

¹⁷⁴ REGLAP (2013), Good practice principles - water development in the drylands of the Horn of Africa.

¹⁷⁵ Flintan, F. (2013), Plotting progress: integrated planning in the drylands of Kenya, Ethiopia and Uganda, REGLAP, and *pers. com.*

where a return to mobile pastoralism is feasible. These are not negative but positive features of irrigated agro-pastoralism: they improve resilience to drought, and flexibility in relation to the market economy.

Conservation of soils and water and sustainable agronomic practice: some dryland landscapes have been transformed by conservation, others degraded by a lack of it. Proximity to river systems and sloping valley sides are likely concomitants of irrigation. Over-reliance on silt fertilization on flood plains may lead to significant nutrient loss, and to maintain productivity a supply of fertilizer is always essential on large-scale farms, and its absence on some small-scale irrigated land will eventually undermine economic viability. Agro-pastoralists reap an additional benefit from a constant, though often inadequate, supply of organic fertilizer.

Educational enablement of individual life chances: the opportunities to move between farming and other economic activities, outside agriculture, are themselves dynamic. As argued above, education is directly or indirectly enabling, and broadening local access to education will have positive feedback on social and economic development.

Extension: technologies for small-scale irrigation are known and documented.¹⁷⁶ Actual practice however may fall short. For pastoralists unaccustomed to the knowledge base and disciplines of irrigation, an ambitious programme of interactive field schools should be recommended. Public investment in human capital in this way can open up choices for autonomous irrigators (rather than impose approved practices from a scheme management).

Action research and innovation relevant to small-scale production units: local knowledge is based on local experience and should be the starting point for exploring innovative options. Top-downward technological advances may not survive the removal of project incentives unless developed with the active participation of the users. Experimentation in crops and farm technologies comes naturally to farmers but not necessarily to pastoralists. Engagement of scientists should be on-farm in nature rather than imported from a research station elsewhere. Development of local innovators as a link between knowledge resources and general practice should be supported. For pastoralists attempting to become farmers, there is special meaning in the maxim, 'because all are farming, it does not mean that everyone is a *good* farmer'.

Provision of economic incentives: profitability is the key to personal, household and community uptake of new practices, but social or cultural values and priorities, family demography (available labour) and competencies also have an economic role in assessing the opportunity costs of alternative choices. Smallholders are investors, if on a micro-scale. Interventions in SSI need not be confined to physical infrastructure and water management, but can attempt to enhance the incentive environment (e.g. marketing costs, relevant education, and health services).

These principles should be applied within a broader policy framework for dryland development. This will not be pursued here, but is the subject of a comprehensive review published by IRAM.¹⁷⁷

¹⁷⁶ Mati, B.M. (2007), 100 ways to manage water for smallholder agriculture in Eastern and Southern Africa. A compendium of technologies and practices. SWMnet Working Paper 13, IMAWESA.

¹⁷⁷ Deygout, P. et al., *ibid.*

A framework for action (road map) for the development of small-scale irrigation is required, but will be specific to each country. An example of action plans from recent discussions is set out in Table 5.3 below. The detail will change, but the strategic perspective may avoid some of the mistakes of the past.

Table 5.3: Framework for action/ Road Map

<i>Technical</i>	<i>Economic & Financial</i>	<i>Policy & institutional</i>
<ol style="list-style-type: none"> 1. Create awareness of FAO/REGLAP studies with forums 2. Prepare Brief of recommendations 3. Present results at a regional meeting (Addis Ababa) 4. Co-ordinate policy makers with implementers 5. KARI, FAO and REGLAP share good practice with practitioners including in curricula of Farmers and Pastoralists Field Schools 6. Learn lessons from experience including impact and monitoring assessments 7. Community participatory planning to minimize conflict 8. Link communities with county level planning 9. Observe IGAD protocols on trans-border livestock movements 10. Improve access to useful information and link to knowledge management structures 	<ol style="list-style-type: none"> 1. Enhance capacities (education, conservation agriculture, commercial farming, appropriate technologies) 2. Financial services (mobile money, agent and community banking) 3. Income generating ventures (crop-livestock value adding, HYVs, contract farming) 4. Fair access (community driven land use, conflict resolution, youth employment, access for women) 5. Integration (public investments for vulnerable groups, local animal product processing, indigenous herbs, gemstones) 6. Public-private partnerships to mobilize investments 	<ol style="list-style-type: none"> 1. Partnership (strengthen IGAD, national institutions, promote public-private and multi-level partnerships) 2. Co-ordination (learning networks, joint implementation, responsibilities) 3. Training/empowerment (rights, governance, resource users' associations, conflict management, NR opportunities) 4. Planning (participatory plans and use, alternative land uses, ecosystem/landscape approach) 5. Research (document best practices, assess resource tenure, compile local knowledge, monitor climate/hydrology, harmonize policy)

Source: REGLAP (2013), Outcomes of the crop agriculture in the drylands workshop, ILRI, Nairobi 6th February 2013

5.4 Research gaps

Very many opportunities for useful research can be perceived in the detail of this review. Water resource development and small-scale irrigation in particular, is insufficiently supported by

knowledge in the Horn of Africa. In this conclusion, six themes only are identified which have a wider reference.

First, at the conceptual level, there is a need for better understanding of integrated development pathways based on sustainable ecosystem management across the sectors and borders. Narrowly conceived interventions need to be contextualized. An important part of this challenge is an effective integration of development strategies with emergency response capacities. Studies have been carried out in projects or along rivers with valuable lessons learnt - for example, in Wabi Shabelle basin.¹⁷⁸ There is a need for consolidation of this experience and development of replicable models.

A second needy area is the acquisition of more and better data sets on all natural resource management themes from hydrological monitoring and modeling, through rangeland management regimes, to the choice of irrigation technologies, agronomy and crop performance. For example,

'If irrigation is to be developed and sustained in the long term . . . then a water balance study . . . to assess the feasibilities of greater withdrawal . . . [and] increasing their charging potential of boreholes should be given greater attention.'¹⁷⁹

While these questions are often solved by trial and error - by experimenting farmers - for good practice in intervention design and implementation, more scientific data banking will improve efficiency and increase the likelihood of success. These data need to be both generic and site-specific, and, of course, available.

A third area is the economics of small-scale irrigation including alternative operational farm management models, comparative returns from small-scale irrigation and livestock,¹⁸⁰ questions of sustainability, and both input and output markets. The balance of supply and demand side factors is especially critical in a region where environmental uncertainty or risk combines with market constraints. The economics are also site-specific and fluid, calling for monitoring of adaptive practice from year to year. There are studies available in descriptive form of particular projects,¹⁸¹ but their value would be enhanced by data on measurable parameters.

A fourth area is that of trade-offs between SSI and alternative land uses (of which grazing is the most important), and alternative uses of labour (herding, labour migration, education). These may be assigned estimated market values for the purpose, which is feasible for major ecosystem services such as livestock, crop production and wildlife.¹⁸² But market values do not necessarily capture social, cultural or spiritual values of a range of ecosystem services that are traded off by

¹⁷⁸ Feinstein/Tufts University (2010), Impact assessment of small-scale pump irrigation in the Somali Region of Ethiopia. PLI Policy Project, USAID/Feinstein/Tufts; Agricultural Working Group (n.d.), Irrigated and rain-fed farming in Somali Regional State, Ethiopia: lessons learnt

¹⁷⁹ Somali Regional State of Ethiopia (2012), Good practice guidelines for water development. Office of the President, Somali Regional State of Ethiopia, Jijiga
http://www.disasterriskreduction.net/fileadmin/user_upload/drought/docs/Good%20Practice%20Guidelines%20for%20Water%20Development.pdf

¹⁸⁰ REGLAP (2013), Outcomes of the crop agriculture in the drylands workshop, ILRI, Nairobi, 6th February 2013
<http://www.disasterriskreduction.net/east-central-africa/documents/detail/en/c/2578/>

¹⁸¹ Action for Development (2012?), Burkitu Water Supply and Micro-irrigation Consolidation Project

¹⁸² Silvestri *et al.*, *ibid.*

women and men agro-pastoralists in choosing among their options. At a higher scale, the true costs of alternative land uses (e.g., sugar plantations versus dry season grazing in riverine areas) need to be known by government planners.

The fifth research area is land and water resource governance. This includes both tenure institutions and access rights to natural resources and also land use zoning, in particular that which is required to reconcile equitably the claims of pastoralists and farmers, and to provide better advice to governments committed to policies of leasehold allocation to corporations. The conflicts of interest have been identified, at least in a general sense, but less work seems to have been done on finding practicable solutions. The highly dynamic political economy of the arid and semi-arid areas calls for detached policy analysis, but also for experience in negotiated agreements (conventions) between contesting parties to be evaluated and taken forward experimentally.

A sixth area is a need for action research, education and extension support in SSI (see Section 5.3). It is questionable whether the traditional model of scientific on-station research, recommendations to planners, external financing, top-down interventions, educating beneficiaries and short-term monitoring really works - specifically for SSI in drylands. New models of demand-led research, participatory project design and execution, private investment and long-term farmer-led monitoring need to be evaluated. Public-Private Partnerships need monitoring and evaluating. Privately financed initiatives developed independently from government support need to be explored, understood and policy incentives devised. The future may rest with this sub-sector.

Disclaimer

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This study is based on a review of the literature which unavoidably reflects uneven thematic coverage, personal interest, accidents of acquisition or non-acquisition, superficiality, and (given a tight schedule) failure to give some authors the amount of attention they deserve. For these reasons I have included full citations so that the discontented reader can check for her/himself. For the impatient, a summary version will be available from REGLAP. Comments are invited.



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