



Policy Brief Series: Livestock

Issue no. 2: Volume X

October 2010

Policies for Enhanced Livestock Productivity and Wealth Creation in a Changing Climate

Key policy messages

Design more coherent and dynamic research and policy agendas, and target investments more adequately to reduce poverty, and vulnerability in the face of climate change. Whilst the way in which climate change impacts on livestock systems is not completely understood we need to act even when there are large uncertainties. We need to understand how production systems will change in future: The target is moving

Climate proof policy frameworks and development planning so they do not become obsolete as environmental and economic conditions change. This goal can be met by stronger integration of land and water man-

agement planning as well as renewed emphasis on trans-boundary resource management.

Devote sufficient resources to adaptation, including infrastructure and market development, diversifying livelihood portfolios to include higher yielding, more stress-resistance crop and livestock varieties to mitigate the effects of climate change on rural populations. The future management of livestock systems will require a mixture of management strategies, technologies and supportive policies and investments. The design and development of adaptation strategies should remain flexible to enable farmers to adjust to the local context and unknown future of climate variability.



Cattle farming is the lifeblood of the Namibian economy

Invest in research for mitigation, the development of the capacity to undertake the research, and development of the required technology. Meeting the demand for livestock products in future carbon-constrained markets will require a mixture of adaptation and simple effective and transparent mitigation strategies. Extensive research has been conducted by the International Livestock Research Institute (ILRI), among other, on strategies for reducing Green House Gases (GHG) emitted by livestock systems. This research should be adapted to the needs of specific countries and regions in Africa and further research should be conducted within these countries.

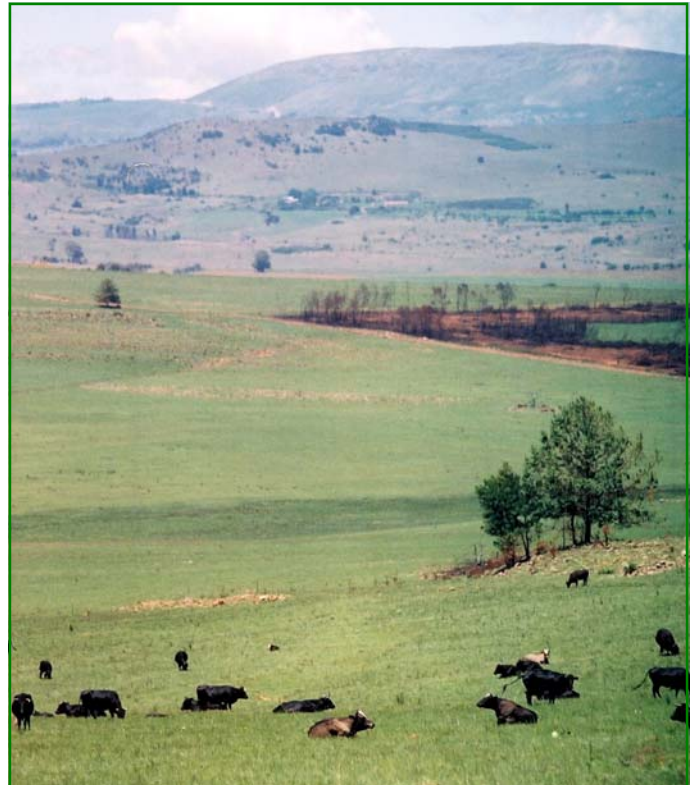
Improve the quality of livestock feeding and supplementation. Improving the quality of livestock diets can significantly reduce the amount of methane produced per unit of animal product produced. Research done at ILRI by M Herrero et al in 2008 and 2010 has shown that poor quality diets produce little milk and a high amount of methane per kilogram of milk and that improving the quality of the diets not only increases milk production, but also reduces the amount of methane produced per kilogram of milk. This increased efficiency would have enormous scope and could be achieved through improved land-use management practices such as improved pasture management, including grazing rotations, fertiliser applications, and development of fodder banks, improved pasture species and use of legumes and through supplementation with crop by-products.

Invest in improving access to livestock value chains, market information, technologies and best practices. Improving market access and value chains for small holder livestock producers can serve as an incentive to adopt best management practices and keep stocking rates in line with fluctuating carrying capacity while improving livelihood security.

Governments and their development partners must invest now in strategic capacity building to attain the goal of safeguarding the livelihoods of livestock-dependent households from the harmful impact of a changing climate. Capacity building across stakeholders, sectors and skill sets is required. Strategic areas of importance for capacity building include research, management, advocacy, communication, and enterprise development.

Emphasis must be placed on increasing private sector

investment in production, processing, marketing and trade to enhance livelihood options and opportunities for the rural poor. There is increased awareness of the critical role of the private sector in sustainable development. Government and civil society cannot provide all the necessary incentives to ensure livelihood security. Therefore, increasing private sector investment at national and regional levels is necessary to reduce poverty and encourage sustainable use of natural resources.



Improving the quality of livestock diets can significantly reduce the amount of methane produced per unit of animal product produced.

Innovative methods to address the impact of climate change within the region exist and should be duplicated and scaled up where appropriate. The Government of the Republic of Namibia, City of Windhoek and NamWater have partnered to address the major challenge of limited water supply. Water stored in dams is being treated and returned to the aquifer to allow for higher production from both sources. This technology is supported by appropriate water use and pricing policies. Other strategies used in Namibia to address challenges of water scarcity include water banking, water reclamation and desalination of sea water.

No Agriculture No Deal. As Africa prepares to host the United Nations Framework Convention on Climate

Change (UNFCCC) Conference of the Parties (COP17), all efforts should be directed at ensuring that Africa speaks with one voice to climate proof its agricultural investments. A climate deal without agriculture is no deal for Africa and indeed no deal for the entire world. Livestock production particularly by poor smallholder farmers can be a greater part of the solution to global warming.

Livestock Development in a Changing Climate

Agriculture in Africa is changing rapidly. Agriculture and livestock systems are among the most climate sensitive economic sectors. The sector employs between 70 and 90 per cent of the total labour force in Africa and supplies up to 50 per cent of household food requirements and household incomes (IFAD, 2008). In pastoral and agro-pastoral systems, livestock are key assets for poor people, providing multiple economic, social, and risk management functions. The impacts that climate change will bring about are expected to exacerbate the vulnerability of livestock systems and to reinforce existing factors that are affecting livestock production systems. Climate change may also increase conflict over scarce resources. Rural communities losing livestock assets might lead to the collapse into chronic poverty with long-term effects on their livelihoods (IFAD).

Many of the climate change predictions suggest that African livestock will be damaged by as early as 2020. According to the International Fund for Livestock Development (IFAD) (IFAD, 2008) it is predicted that climate change will cause the number of beef cattle to decrease and that of sheep and goats to increase. Consequently, farmers may switch from beef cattle as temperatures rise. The net profitability of livestock will be reduced and farmers may reduce their investments in livestock. Other studies have shown that climate change may lead to shifts in livestock and crop keeping in Africa by 2050, as livestock may provide an alternative to cropping (Jones and Thornton, 2009 as cited in Herrero et al., 2010). Increasing frequencies of heat stress, drought and flooding may have further impacts on crop and livestock productivity (Herrero et al., 2010).

In southern Africa the impacts of climate change on livestock, according to Agricultural Systems Analyst, Mario Herrero, (ILRI), will be diverse but potentially severe. Herrero made a presentation at the FANRPAN

Annual Meeting in Namibia September 2010: Livestock and Fisheries Policies for Food Security in a Changing Climate where he emphasised the need for policy makers, researchers, farmers and civil society to understand how production systems will change in order to design coherent and dynamic research and policy agendas that benefit the poor and to target investments more adequately for reducing poverty and vulnerability.

Whilst the impact of climate change on livestock systems is still not completely understood there will be implications for land use, food security, production of feeds, distribution of diseases and/or their vectors, water availability, biodiversity and for GHG emission. There will also be an increased frequency of climatic extreme events (droughts/floods) erosion and soil degradation. At the same time the linkages between livestock and climate change, which are two-way and dynamic (Herrero et al., 2010) should also be taken into account. Climate change affects livestock production inter alia through its impact on the quantity and quality of feed, animal and rangeland biodiversity, and changes to management practices and production systems. Livestock, in turn, emits GHG that contribute to climate change.

The livestock emissions are dependent on the farming system, with high emissions emanating from animals fed on poor diets, to poor digestion and slurry from animals that are kept indoors (under intensive dairy systems). However, as highlighted by Herrero et al., there are large differences between regions and livestock production systems in the sources and types of GHG emissions. There is a "complex balancing act of resource use, GHG emissions and livelihoods" that requires better understanding. New research, methodologies and indicators are thus needed to inform more accurately the debate on how livestock contributes towards climate change, as well as to be able to better weigh the environmental impacts vis-à-vis the social benefits (Herrero et al., 2010).

Mitigation and Adaptation: We need to act even when there are large uncertainties

Meeting the demand for livestock products in future carbon-constrained markets will require a mixture of adaptation and simple effective and transparent mitigation strategies according to Hererro et al (2010). Live-

stock systems will have to adapt to global warming. Adaptation options will however depend largely on how we shape the world and once again there are many scenarios and a lot of uncertainty. Depending on the different paradigms of agricultural development (industrial vs pro-poor smallholders, large vs family farms), globalisation and trade partners, consumption patterns, carbon constraints, roles and incentives for technology and more, the options for adaptation could include the following: Breed or species changes (from cows to camels for example); rangeland management; development of water resources; disease control and surveillance; policies, support tools and regulations (insurance, early warning etc.); and payments for ecosystem services (carbon, wildlife etc.) The design and development of adaptation strategies should therefore remain flexible to enable farmers to adjust to the local context and unknown future of climate variability. (Herrero presentation, 2010)



Farmers and livestock dependent households are not only the victims of a changing climate but can make valuable contributions to adaptation and mitigation efforts in Africa

A subject of considerable debate and negotiation at the Kyoto and Bali climate change negotiations, has been the proposal of mitigation as a key strategy to reduce GHG emissions. According to Herrero et al (2010) there is significant potential for the reduction of emissions through the effective management of livestock systems. Strategies for mitigating methane from livestock industries, improving diets of ruminants and control of animal herd numbers could be important mitigation strategies. Improving the quality of ruminants' diets can significantly reduce the amount of methane produced per unit of animal product produced (Monteny et al., 2006). This increased efficiency would have enormous scope

and could be achieved through improved land-use management practices such as improved pasture management, including grazing rotations, fertiliser applications, development of fodder banks, improved pasture species and use of legumes and through supplementation with crop by-products. (Herreo et al., 2010)

Herero (Herrero et al., 2010) describes the use of a validated dynamic model for predicting feed intake and nutrient supply in ruminants as the basis for calculating the methane produced from enteric fermentation. Details of the model can be found in Herrero et al. (2008). The model shows that poor quality diet produces little milk and a high amount of methane per kilogram of milk and that improving the quality of the diets not only increases milk production. but also reduces the amount of methane produced per kilogram of milk. More research is required in different locations with different diet combinations. This framework can be expanded to include the economic efficiency and profitability of each of the diets, and therefore quantify the economics of reaching methane emission targets. This could be extremely important for commercial livestock production or where resources are scarce and their use needs to be carefully planned.

Livestock Policies for Africa's Food Security in a Changing Climate

The two-way linkages between climate change and livestock have to be further explored in order to ensure that the livelihoods of livestock-dependent households are safeguarded. Farmers and livestock dependent households are not only the victims of a changing climate but can make valuable contributions to adaptation and mitigation efforts in Africa. This question was among the topics that were discussed at the 2010 FANRPAN Regional Food Security Policy Dialogue hosted in Namibia.

Over 200 policymakers, farmers, agricultural product dealers, scientists and non-governmental organisations from across Africa and the world gathered to address African priorities on food security and climate change and its impacts on agricultural development, natural resource management and rural livelihoods. Participants adopted a set of draft recommendations, which could contribute towards efforts to balance environmental concerns with those of livestock-dependent households.

The following draft recommendations relate to how the impact of climate change on livestock and vice-versa could be addressed in Africa:

- It was noted that *agriculture in Africa is changing rapidly* and that understanding how livestock, fisheries, and crop production systems could change in the future is critical. It was recommended that emphasis be placed on designing more coherent and dynamic research and policy agendas, which are necessary to reduce poverty and vulnerability in the face of climate change.
- Participants recommended that *policy frameworks and development planning be climate proofed* so they do not become obsolete as environmental and economic conditions change. This goal can be met by stronger integration of land and water management planning as well as renewed emphasis on trans-boundary resource management.
- Participants discussed the likely impacts of climate change on the livestock and fisheries sectors, characterised by shifting habitats or ecosystems but acknowledged considerable uncertainty in understanding these interactions. Future management of these systems will require a mixture of management strategies, technologies and supportive policies and investments. It is recommended that *sufficient resources be devoted to adaptation*, including infrastructure and market development, to mitigate the effects of climate change on rural populations.
- *Political will and commitment are needed* to address the impacts of climate change on agriculture, fisheries, and rural livelihoods in general. Investment in research for mitigation, the development of the capacity to undertake the research, and technology development help support that political will and commitment. Therefore, it is recommended increased investment be made in these areas.
- *Improving market access and value chains* for small holder livestock producers can serve as an incentive to adopt best management practices and keep stocking rates in line with fluctuating carrying capacity while improving livelihood security. Therefore, it is recommended investment in improving access to livestock value chains, market information, technologies and best practices is implemented.
- Participants discussed the *need for capacity building across stakeholders, sectors and skill sets*. Therefore, it is recommended that development partners invest now in strategic capacity building to meet long-term goals. Strategic areas of importance for capacity building identified during the dialogue include advocacy, communication, research, management and enterprise development.
- There is *increased awareness of the critical role of the private sector* in sustainable development; government and civil society cannot provide all necessary incentives to ensure livelihood security. Therefore, increasing private sector investment at national and regional levels is necessary to reduce poverty and to encourage sustainable use of natural resources. Participants recommend that emphasis be placed on increasing private sector investment in production, processing, marketing and trade to enhance livelihood options and opportunities for the rural poor.
- The Government of the Republic of Namibia, City of Windhoek and NamWater have partnered to address the major challenge of *limited water supply*. Water stored in dams is being treated and returned to the aquifer to allow for higher production from both sources. This technology is supported by appropriate water use and pricing policies. Participants recognise Namibia's excellent efforts at natural resources management, including her scarce water resources, which includes strong government and stakeholder participation. It is recommended that innovative methods, such as those currently used in Namibia to address challenges of water scarcity (for instance water banking, water reclamation and desalination of sea water), should be publicised and emulated by the other countries in the region where appropriate.

Focus on Namibia Livestock Production

Agriculture in Namibia

Agricultural production suffers from *low and variable*

rainfall along with low soil fertility levels. Livestock farming makes up the majority of the sector. Agricultural exports, including processed meat and other food products contributed 7.2 per cent to total exports in 2008, and help maintain a positive trade balance for the nation. Agriculture production makes up 10% of GDP but accounts for 60% of rural jobs (Dirkx, 2011), and livestock farming contributes 75% to the overall sector (FAO, 2011). Furthermore, the manufacturing sector is made up primarily of meat processing, and generates 6.2% of all rural jobs. By contrast the mining sector, though a large contributor to GDP, employs just 2% of the labour force.

Agriculture is segmented into *two different and uneven sectors*. First, the commercial sector consists of 4,000 freehold farmers who primarily grow livestock. Second, the "communal" sector supports about 140,000 families, mostly in the north. These farms suffer from low productivity, and lack of appropriate farming methods. They are generally poor, and suffer from food insecurity. Furthermore crops are rain-fed which leaves them very susceptible to climate change. Land titles are scarce and farmers in the communal sector have little access to international markets.¹

Livestock production in Namibia

Overall cattle production has increased from 2 million to 2.5 million over the past twenty years. While cattle raised on commercial lands have diminished recently, communal cattle farming has increased putting pressure on community grazing areas. A rising population and the construction of illegal fences to hold communal land for private use compound these problems.

Meat production is the largest contributor to the livestock sector, however other products are also important. For example, milk production, especially for the domestic market, is on the rise. In July of 2009, a dairy farm was established which currently produces 18,000 liters of milk per day.² The plan is to raise production to 60,000 liters and explore export markets in the region. Importantly, an irrigation system from a nearby dam supplies the water for fodder crops to feed the dairy cows. In addition to cattle, goats and sheep are also raised in the southern part of the country. Wool and pelts from these animals are successfully sold in international markets and make up a small but growing part of agricultural output.

Namibia's traditional agriculture exports consist of live animals plus beef, mutton and goat meat to South Africa and the EU. Some Namibian ranchers have worked hard to remain in compliance with European sanitary standards and currently enjoy the profits of their efforts. A trade quota system with the EU (which Namibia never maximized) has recently been replaced by a duty free agreement; however, Namibia has yet to signed the agreement because of certain issues.

Livelihoods

Many farmers' livelihoods are tenuous. *Unemployment in Namibia increased* between 2004 and 2009, moving from 37% to 51%. It is assumed that the rate has increased since. Subsistence farming is the main source of income for nearly 50% of rural households. Despite government grants and remittances from family members working elsewhere, there is widespread poverty among rural populations and the elderly. Over 38% of the population is considered poor, and when considering rural populations that number climbs to nearly 50%.

Climate change in Namibia

Namibia is one of the driest countries in southern Africa and climate change will likely make it drier. A high-pressure system off the coast combines with cold-water temperatures to keep the cold and dry air over much of the country. Typically storms pass south and west of the country. Average rainfall is between 25mm and 700mm per annum. Anticipating climate changes in Namibia, temperatures are expected to rise most in the northeast portion of the country, by 1.0-3.5 °C (considering min. to max. impact scenarios). Predictions concerning rainfall suggest a 10% to 20% decrease across all of Africa (De Wit and Stankiewicz 2006). Models predict that winter storms will move further south, reducing rainfall in the more fertile and populous northern areas, and bring occasional but heavy rains over much of the nation.

Climate Change impacts on livestock

A reduction of rainfall combined with increased temperatures will place a great deal of stress on Namibia's agriculture. Increasing demand for irrigation water will further stress existing rivers, which are few.

Climate change will impact the livestock sector in many ways. The quality and quantity of grazing lands will be affected and bush encroachment, already a problem, may worsen (Bush encroachment involves

1. FAO (http://www.fao.org/nr/water/aquastat/water_use/index.stm)
2. allafrica.com/stories/200907061598.html

overgrown bushes infringing on rangeland. The bushes' extensive root systems make them difficult to remove.). Additionally livestock production and reproduction may be affected as temperatures rise. Water availability will diminish while demand increases, and it is expected that disease and parasites will also be on the rise.



Livestock production and reproduction: water availability will diminish while demand increases

Bush encroachment is already detrimental to Namibia's livestock industry. Losses are estimated at N\$ 700 Million per annum (de Klerk 2004). As a result, bush encroachment has a direct impact on the livelihoods of both communal and commercial farmers and their employees (DRFN/CSAG 2008).

The projected increases in temperature may also affect livestock production, due to heat stress. *Heat stress* in animals reduces their appetite and food intake. This may reduce dairy production, and reproductive effi-

ciency. Both lamb and beef calves grow at a slower rate when stressed. Conception rates in cattle will fall if average maximum temperatures exceed 34°C for much of the hot season. According to some projections the frequency of days exceeding 34°C will increase from 67 to 118 days in the period 2045 and 2065 (DRFN/CSAG 2008). Dairy cattle may face even more severe heat related stress given the temperature changes predicted for Namibia. As a result, milk production may suffer, as animals with the highest milk yields suffer first from heat. Sheep often respond to excessive heat through reduced fertility.

Livestock production may be also affected by *water demand* as temperatures rise and precipitation falls. Available water for livestock is an additional consideration, as many herds typically travel large distances to forage. This phenomenon can limit production directly through reductions in metabolic rates and feed intake and indirectly by reducing the area grazed through restriction of distance travelled from watering points. Areas around water points may also suffer a greater degree of land degradation (Dirkx and Schade 2011).

On top of these factors, the *Namibian population is expected to grow 66 per cent* by 2031. Most of this growth is likely to occur in rural areas and among poor families. The combination of the factors listed above, and population increase means a major threat to the food security of many Namibians. A recent assessment of the impacts of climatic change on the agricultural and fisheries sectors forecasts a decline of 1.1% to 3.1% in GDP for the agriculture sector (Reid et al. 2007). According to the authors, livestock production is likely to decline by between 19% and 49%, and subsistence agriculture by 33% to 75%.

References

- Allison, H. E., Adger, W. N., Badjeck, M., Brown, K., Conway, D., Dulvy, N.K., Halls, A., Perry, A., and Reynolds, J.D., 2005. *Effects of Climate Change on the Sustainability of Capture and Enhancement Fisheries Important to the Poor: analysis of the vulnerability and adaptability of fisherfolk living in poverty*. Fisheries Management Science Programme Department for International Development, University of East Anglia.
- De Klerk, 2004, Bush Encroachment in Namibia: Report on Phase 1 of the Bush Encroachment Research, Monitoring and Management Project. Windhoek, MET
- De Wit, M. and J. Stankiewicz, 2006. Changes in Surface Water Supply across Africa with Predicted Climate Change. *Science*. 311: 1917-1921.
- Dirkx, Eirk-Jan and Schade, Klause 2010. Namibia, Status Report on Agriculture, Fisheries, Water, Livelihoods and Climate Change.
- DRFN / CSAG, 2008. Climate Change Vulnerability and Adaptation Assessment - Namibia. A study in preparation of the Second National Communication. Desert Research Foundation of Namibia and Climate Systems Analysis Group, on behalf of the Ministry of Environment and Tourism and the Namibian Committee on Climate Change. Windhoek, March 2008.

FAO, http://www.fao.org/nr/water/aquastat/water_use/index.stm.

FAO, 2008. *Climate-related Transboundary Pests and Diseases Including Relevant Aquatic Species*. Expert meeting, FAO. February, 2008.

FAO, 2008. *The state of world fisheries and aquaculture*. FAO, Rome.

Holdren P. John, 2008. *Meeting the Climate-Change Challenge*. Washington DC.

Hussein, K., Calvosa C., Roy R. and the Global Environmental Facility Unit/IFAD, 2008. *The Effects of Climate Change on Small Holder Farmers in West and Central Africa*. Published for the 10th Meeting of the Africa Partnership Forum, April 2008, Tokyo, Japan.

IFAD (Text by Rota A., Calvosa C.). 2008. *Livestock and Farming System*: learning note.

IPCC, 2007. *Fourth Assessment Report*. K. Hussein, C. Calvosa et al (2008). *The Effects of Climate Change on Small Holder Farmers in West and Central Africa*. 10th Meeting of the Africa Partnership Forum, April 2008, Tokyo, Japan.

ILRI M. Herrero, P.K Thornton, A. Notenbaert, S. Moyo, *Livestock Development in a Changing Climate* presentation at the FANRPAN Annual Meeting: Livestock and Fisheries Policies for Food Security in a Changing Climate, 30th August - 3rd September, 2010, Windhoek, Namibia

ILRI, CTA, University of the Free State 2010 *The role of livestock in developing communities. Enhancing multifunctionality*. Chapter by M, Herrero, P.K Thornton, P. Gerber, A. van der Zipp, J. van Steeg, A.M. Notenbaert, P. Lecomte, S Tarawali and D Grace *The Way Forward for Livestock and the Environment*

Reid, H., S. Sahlén, J. MacGregor, et al. (2007). *The Economic Impact of Climate Change in Namibia: How Climate Change Will Affect the Contribution of Namibia's Natural Resources to Its Economy*. London, IIED.

Disclaimer: The work reported in this publication was made possible through support provided by the Regional Center for Southern Africa, U.S. Agency for International Development, under the terms of Cooperative Agreement No. 690-A-00-05-00185-00. The opinions expressed in this publication are those of the author(s) and do not necessarily reflect the views of the U.S. Agency for International Development

This document has been produced with the financial assistance of CTA. The views expressed herein are those of the author(s) and can therefore in no way be taken to reflect the official opinion of CTA; representative of FANRPAN or of the cosponsoring or supporting organizations.



About FANRPAN

The Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) is an autonomous regional stakeholder driven policy research, analysis and implementation network that was formally established in the Southern Africa Development Community (SADC) in 1997. FANRPAN was borne out of the need by SADC governments who felt that comprehensive policies and strategies were required to resuscitate agriculture. FANRPAN is mandated to work in all SADC countries and currently has activities in 14 Southern African countries namely Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

Copyright

FANRPAN Regional Secretariat

141 Cresswell Road, Weavind Park 0184, Private Bag X2087, Silverton 014, Pretoria, South Africa

Telephone: +27 12 804 2966 Facsimile: +27 12 804 0600

Email: policy@fanrpan.org Website: www.fanrpan.org