The Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN)

Analyses of existing institutional arrangements and the policy environment for managing risk related to crop production and post-harvest handling in climate disaster areas, with specific reference to smallholder farming in South Africa

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ANALYSES OF EXISTING INSTITUTIONAL ARRANGEMENTS AND THE POLICY ENVIRONMENT FOR MANAGING RISK RELATED TO CROP PRODUCTION AND POST-HARVEST HANDLING IN CLIMATE DISASTER AREAS, WITH SPECIFIC REFERENCE TO SMALLHOLDER FARMING IN SOUTH AFRICA

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By

Dr Phineas Khazamula Chauke

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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

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1. Introduction

This report covers crop production and post-harvest management policies that affect smallholder framers, with a special focus on climate change disasters. Relevant institutional arrangements are also reflected upon and the report concludes with recommendations directed at policy makers.

1.1 Country **overview**

South Africa is located at the southern tip of Africa, bordered by the Atlantic Ocean to the west and the Indian Ocean to the south and east, with Namibia, Botswana, Zimbabwe, Mozambique and Swaziland forming its northern borders. The country covers 122000 km^2 and has about 52 million inhabitants who depend substantially on electrical energy (87 percent) and piped water in dwellings (74 percent). About 21 percent of households are agricultural, and 90 percent of those households are black. The area of land under agricultural production, especially of major crops such as maize, wheat and grain sorghum, has been declining over a number of decades, but productivity has been increasing, resulting in stable crop production or moderate increases.

In recent years the contribution of agriculture to the GDP has been between 2% and 3% and has been gradually declining as the South African economy reorients to the secondary and tertiary sectors (SADC, 2011). About 13 percent of South Africa's surface area can be used for crop production. Some 1.3 million hectares are under irrigation. The most important factor limiting agricultural production is the availability of water. Rainfall is distributed unevenly across the country. Almost 50 percent of South Africa's water is used for agricultural purposes.

The agricultural sector in South Africa is characterized by dualism. Large-scale commercial and smallholder sectors exist side-by-side. The former comprises of well-resourced, large, mainly white-owned and operated farms. Superior production techniques allowed this sector to produce surplus maize in the 2009/10 season. The latter are resource-poor, small farms owned and operated by black farmers who mainly produce for subsistence and lack institutional support (Mudhara, 2010). Smallholder farmers in South Africa face various challenges to their growth and ability to contribute to food security compared to the commercial farmers, such as lack of access to land. Most smallholder farmers are located in rural areas and mostly in the former Bantustans, where a lack of both physical and institutional infrastructure limits their expansion. Lack of access to proper roads, for example, limits the ability of a farmer to transport inputs and produce and to access information. Markets for agricultural inputs and outputs are often missing and unreliable for smallholder farmers (DAFF 2012a).

1.2 Climatic risks to smallholder crop production in South Africa

Climatic risks faced by farmers in South Africa include floods, cyclones, tornadoes, snow and drought. The provinces that are mostly affected by cyclones are Mpumalanga and Limpopo. Devastating cyclones occurred during the years 1950, 1966, 1977, 1984 and 2000,

destroying crops, infrastructure and property. More than200 lives were lost due to the five cyclones. Hailstorms occur in all provinces, and they damage crops, and especially horticultural crops and vines. Floods occur in all the provinces but mainly Gauteng and KwaZulu-Natal. They destroy crops, property and infrastructure. Between 1974 and 2000, a total of 500 lives were lost due to floods. Extensive snow fall in the Eastern Cape also results in flooding, leading to deaths of people and livestock. Drought occurs in all the provinces, and smallholders are mostly affected because they rely on rain-fed agriculture. The drought of 2004 caused massive crop failure. The fluctuation of rainfall over the farming season and late onset of rainfall also affects farmers negatively, while rainfalls during the harvest period causes rotting and germination of maize while in the field.

1.3 Crop production and post-harvest handling risks to smallholders in South Africa

The way crops are handled after harvest differs from one crop to another. For cereal crops (mainly maize) they include field drying, platform drying, threshing/shelling, winnowing, transport to store and transport to market. It is estimated that physical grain losses before processing can range from 10 percent to 20 percent. Losses also occur when grain decays or is infected by pests, fungi and microbes. It is estimated that about 12.3 percent of maize is lost through post-harvest handling in South Africa, while Oelofse and Nahman (not dated) calculated that average food waste ranged from 19% for cereals to as much as 52% for fruits and vegetables.

Table 1: Calculated average per annum food waste generation figures for South Africa (2007-2009)

Commodity group	Production (1000 tons) Average for 2007-2009	Wastage (tons)							Total waste (%)
		Agricultural Production	Post-harvest and storage	Processing and packaging	Distribution	Pre-consumer waste	Consumption	Total waste	
Cereals	13154	789.3	989	398	220	2396	108	2504	19.1
Roots and tubers	2017	282.4	312	213	60	869	23	892	44.2
Oil seed and pulse	453	54.4	32	29	7	122	3	126	27.8
Fruit and vegetables	8230	823.0	667	1685	859	4034	210	4244	51.6

Source: Oelofse and Nahman (Undated).

2. Methodology

Secondary data for this study was sourced from policy documents developed at the global and local levels related to climate change risk, specifically as they affect crop production and post-harvest losses. Primary data came from qualitative interviews with key informants selected by purposive sampling. Institutional stakeholders included experts from universities, farmers on land reform projects and women's groups focussing on agricultural production. Responses were summarised based on the study's themes.

3. Regional policies and institutional arrangements for managing climatic risks to smallholder farmer crop production and post-harvest handling

3.1 Major international and regional policies, post-harvest management and institutional arrangements for managing climatic risks faced by smallholder crop farmers

The Global Campaign for Action on Climate (GCAC) is a global alliance of non-governmental organizations, trade unions, and faith groups that is geared towards implementing global and regional climate-change policies. Participation of farmers, especially smallholders, is either low or non-existent owing to lack of popularizing campaigns.

The United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol aim at stabilizing greenhouse gas concentrations in the atmosphere, but has not been exposed to or enforced on smallholders in South Africa. It has a membership of 195 parties that meet annually from 1995 in the Conferences of the Parties (COPs). One such conference was held recently in Durban, SA. Direct participation and beneficiation of smallholders has not been visible in South Africa.

SADC Regional Remote Sensing (RRS) was conceived as a project of SADC in 1988 and received technical assistance from the United Nations Food and Agriculture Organization (FAO). It was integrated into the Food, Agriculture and Natural Resources Development Unit. Few benefits have reached smallholder farmers.

AfricaBio is an NGO that focuses on the provision of accurate information to create awareness and understanding on biotechnology and biosafety in South Africa and the African region. It has transferred information about biotechnology and biosafety to some smallholders.

The UN Development Assistance Framework (UNDAF) in South Africa focuses on provision of technical services especially for *smallholder beneficiaries of land reform.* Although smallholders are not directly represented in its activities, implementation by the Food and Agricultural Organization of SA and the Department of Agriculture, Forestry and Fisheries (DAFF) has benefitted many land reform smallholders, especially through technical support.

EAC - COMESA - SADC Tripartite aims at harmonizing programs that target trade and infrastructure development across Africa. It is still at the developmental phase and has not been implemented for smallholders in SA.

SADC Engendered Position Paper on Climate Change, with its focus on gender equality, has been successfully implemented for smallholders in South Africa.

African Agricultural Development Program (AADP) is managed by all 26 heads of African states with a focus on developing Africa's agricultural sectors. Implementation that would benefit smallholders is largely not yet realized.

SADC Disaster risk Management strategy: The strategy is managed by SADC member states, NGOs, donors, civil society and the private sector. A Disaster Risk Reduction Unit was established in 2007. Its swift reaction to disasters in the region has indirectly benefited South African smallholders.

3.2 National policies and institutional frameworks for managing climate risks on smallholder farmer crop production

The SA National Climate Change Response Policy (SANCCRP), administered by the Department of Environmental Affairs (DEA) together with other departments, was initiated to manage the effects of climate change and to contribute towards the global effort to stabilize greenhouse gas concentrations in the atmosphere. Although research institutions, especially universities, are producing relevant research, the results have mostly failed to reach relevant stakeholders such as smallholders. The failure is partly because of minimal commitments to budgets and reliance on the Municipal Infrastructure Grant.

The Natural Resources Management (NRM) Policy is administered by the Department of Environmental Affairs and the provincial agriculture departments. Smallholders have been extensively involved in this policy through the various nation-wide rehabilitations. The policy has also led to the development of a natural resources atlas with comprehensive planning

data in five provinces, namely KwaZulu-Natal, Northwest, Northern Cape and the Eastern Cape. About 92 742 hectares have been rehabilitated.

The Disaster Management Act No. 57 of 2002 is administered by the Intergovernmental Committee on disaster reduction and the National Disaster Management Forum within the National Disaster Management Framework. The act focuses on facilitating climate change mitigation, adaption strategies and early warning systems but implementation for smallholders is either weak or still in development.

The Drought Management Strategy (DMS) is a sub-directorate of DAFF that is responsible for water conservation, especially reductions in water use during droughts. All farmers – including smallholders - have benefited from input provision (feeds etc.)

The Agricultural Production Action Plan (APAP) is a National Development Plan (NDP) initiative managed by DAFF. It promises one million jobs in agriculture and land reform by 2030.

The Genetically Modified Organisms (GMO) Act No. 15 of 1997 is a DAFF-initiated law that focuses on limiting exposure to the harmful effects of GMOs. The Act was promulgated to promote responsible development, production, and application of genetically modified organisms and to contain environmental harmful consequences. Although smallholders do not directly participate in production of GMOs, indirect benefits accrue from compliance by the large-scale farming sector.

The Biofuel Industrial Strategy (BIS), administered by the Department of Energy, was initiated to increase energy provision. The 2006 strategy envisaged that South African could achieve a 4.5 percent penetration of biofuels by 2013, given South Africa's climatic condition, agricultural potential, land availability and food security, and thus contribute to energy security and job opportunities. This target was largely not realized. The country is still facing energy crises.

The Strategic Integrated Projects (SIPS) focus on social and economic infrastructure development across all nine provinces of South Africa. The catalytic projects are expected to fast-track development and growth. The anticipated projects are expected to contribute significantly towards proper human settlement planning and skills development, to the benefit of smallholders in that they would be provided with appropriate accommodation.

White Paper on Agriculture, 1993, developed by DAFF, has initiated a number of programs. Specifically the policy formulated a base for the development of enabling legislation, especially laws directed at land reform and equitable access to agriculture. It also opened up opportunities for the establishment of various policies directed at smallholder farmers, such as the Restitution of Land Rights Act, 22 of 1994.

The 2001 Strategic Plan for South African Agriculture was developed by DAFF as a base for transformation of the SA agricultural sector, especially with respect to risk management. The strategy sought to address equity within the sector but many smallholders did not adopt the envisaged risk management tools identified by the strategy.

The South African Land Reform Program is administered by the Department of Rural Development and Land Reform although implementation has devolved to DAFF and various NGOs. The program established legislation on land restitution, redistribution and tenure reform for smallholders, communities and farm workers/labour tenants. Implementation has been very slow but large sums of money have been transferred either to farm owners or beneficiaries through restoration and cash compensations.

The Agricultural Broad-Based Black Economic Empowerment (AgriBEE) is administered by the DTI, DAFF, and Land Bank, which handles disbursement of funds towards skills development, employment equity and preferential procurement. However set targets such as scoreboards to determine shareholding or management of business have largely not been realized within agriculture.

The Comprehensive Agricultural Support Program (CASP) is monitored by DAFF but administered through the Land Bank. Billions of rands have been disbursed to about 69000 smallholder farmers for infrastructure provision to land reform beneficiaries, and for poverty alleviation through the Ilima/Letsema project, which was initiated in 2004 to provide agricultural support services benefiting 38120 smallholders.

The Integrated Food Security and Nutrition Program is administered under the Food Security and Agrarian Reform sub-program of DAFF and the Department of Rural Development and Land Reform (DRDLR). More than 139 000 hectares of agricultural land have been cultivated. The program aims to provide inputs, implements and infrastructure support to smallholders to improve their food security statuses.

The Integrated Strategy on the Promotion of Entrepreneurship and Small Enterprises (ISPEE) resides in the Ministry of Trade and Industry, where it is implemented by the Small Enterprise Development Agency with the intention of improving crop production and post-harvest handling through preferential procurement and small grants. It also provides financial assistance to smallholders in marketing their produce, a service that has been effectively used, although to a minimal scale.

The Smallholder Producers' Strategy (SPS) falls under DAFF's Smallholder Development Working Group, which has representation from other government and non-government organizations including the Agricultural Research Council (ARC), the DRDLR and the Department of Economic Development to support smallholders through CASP and other programs. It provides information on support services to smallholders. More than 2 100 smallholders benefited in 2011/12 and 18 671 smallholders in 2012/13 through CASP and llima/Letsema intervention.

The Zero Hunger Program (ZHP) is a DAFF initiative that allocates funds for input acquisition to generate income. It specifically seeks to promote food security. By 2011, more than R150 million had been approved for allocation towards the program. Research into the effects of the policy, has not been widely conducted.

The Strategic Plan for Supporting Smallholder Producers is administered by the Department of Water Affairs and Forestry through its Smallholder Development Working Group. Its focus is infrastructure provision. The plan is yet to fulfill its objectives as smallholders are still experiencing critical infrastructure backlogs.

The National Framework for Extension Recovery Plan (ERP) was initiated by DAFF in collaboration with all provincial agriculture departments. It aims to revitalize extension services throughout the country. ERP consolidated the recommendations of the Extension Indaba that sought to revitalize extension and advisory services in SA. If correctly implemented, smallholder farmers could benefit immensely from a responsive extension service.

3.3 National policies and institutional frameworks for managing climatic risks on smallholder farmer post-harvest handling

The SA Post-Harvest Innovation (PHI) Programme is public-private initiative consisting of the Department of Science and Technology (DST), the Fresh Produce Exporters' Forum, academic institutions and other government agencies. The policy aims to innovate technology for the post-harvest leg of the fresh fruit value chain, but no records of smallholder farmers' involvement in the program could be detected.

The 2012 South African Agro-processing Strategy (SAAS) is administered by DAFF. ARC's research on agro-processing for DAFF identified its potential for large-scale job creation. The policy articulates how government should support a thriving the small and medium entrepreneurs in agro-processing, and forecasts the creation of 145 000 jobs in agro-processing on smallholdings by 2020.

The Plant Production and Health sub-program is a policy meant to support smallholders in crop and cultivar selection and in appropriate plant production technologies, harvest and postharvest practices in all nine provinces. It has benefitted more than 2400 farmers.

4. Non-governmental and civic structures that impact on crop production and post-harvest management

United Nations Food and Agricultural organization (FAO) is an international non-profit organization that seeks to achieve universal food security. Despite the positive objectives and sufficient world capacity to produce enough food for everyone, many people, especially children, still suffer from chronic hunger. The relevance of FAO to smallholder farming in South Africa, especially the provision of technical support to land reform beneficiaries, was highlighted above.

Association for Rural Advancement (AFRA) is an NGO that works on land rights and agrarian reform especially in KwaZulu-Natal. It focuses on African rural people whose rights to land have been undermined and whose tenure is insecure. AFRA seeks to empower communities to engage with land reform processes to meet their needs.

Poverty, Land and Agrarian Studies (PLAS) is a specialist unit of the School of Government, Economic and Management Sciences at the University of the Western Cape that was founded in 2005. The unit focuses mainly on quality research for land and agrarian reform but it has also provided training, advice, facilitation and evaluation services to various communities, especially land reform beneficiaries.

Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) is an autonomous, non-profit, scientific organization with a mandate to co-ordinate policy research and dialogue and recommend strategies for promoting the food, agriculture and natural resources sector in its member states. Its major focus presently is Climate Smart Agriculture, targeting smallholder farming in South Africa, Malawi, Zimbabwe and Madagascar.

Agri-Aids South Africa was founded by the US President's Emergency Plan for Aids Relief, United States Agency for International Development and the SA National Department of Health in 2012. It concentrates on organizing and implementing HIV/TB and wellness programs for farm workers. Agri-Aids SA has entered agreements with farm owners in the 11 districts of different provinces where it is active, such as Ha-Ratombo restitution Farms in the Vhembe District of Limpopo, where almost 247 farm workers were tested for HIV/AIDS by 2012.

The African Farmers Union of South Africa (AFASA) was established in April 2011 as a mouthpiece for emerging farmers after dissatisfaction with the financial management of the National African Farmers' Union SA. It seeks to promote effective management and administration for its members through development of services centers that would lead to acquisition of land, credit facilities etc. Through its intervention R6.2billion was allocation towards the development of the sub-sector. It was also instrumental in programs such as CASP, Land Care program, Ilima/Letsema program and mobilization of farmers, especially women and youth into agricultural cooperatives.

5. National and international research organisations researching and supporting smallholder crop production and post-harvest handling

The following organisations and universities conduct research into smallholder farming. Their various efforts are not co-ordinated.

The Agricultural Research Council (ARC) established the Smallholder Farmer Agricultural Development (SFAD) program in 1995 to address smallholders' crop production challenges, especially lack of proper knowledge about agronomic practices, use of farm machinery, and lack of funds to purchase production inputs and the like. SFAD interventions included wheat production courses, demonstration trials, farmers' information days, and SMS to alert farmers to the latest developments (including post-harvest challenges).

The Water Research Commission (WRC) coordinates water research development and management strategies. Its research aims to contribute to the improvement of farmers' livelihoods. One of its recent studies highlighted the need for training extension staff in

irrigation management to better support farmers and to reduce crop management constraints.

The South African National Bio-diversity Institute (SANBI) was initiated in terms of the Biodiversity Act under the Global Change Research Group and is devoted to a multitude of projects that look into global climate change and its effect on biodiversity, invasive species, land-use change and response planning. One of its study results revealed low general awareness of agricultural technology among smallholders and incompatibility of their practices with biosafety requirements.

Various universities host units such as Stellenbosch's South African Research Chair in Postharvest Technology, established in 2009 under the Department of Science and Technology's National Research Foundation. Its primary goal is to produce cross-cutting innovative research and human capacity development to support South Africa's agricultural and horticultural postharvest industries.

The National Agricultural Marketing Council (NAMC) recently conducted a study that produced an instrument to calculate the amount of carbon that is emitted along the supply value chain.

6. National research on managing climatic risks on crop production and post-harvest handling

6.1 Knowledge gaps on managing climatic risks to crop production

There are several problems with the existing knowledge about managing climatic risks to crop production in South Africa's agriculture sector:

a. Implementation and integration: As articulated above, South Africa has formulated a number of policies targeting crop production and post-harvest management. The challenge, however, is lack of implementation or minimal implementation especially for smallholder subsistence farmers. Most government agencies operate in silos with minimal integration of activities.

b. Matching national and provincial level knowledge: While most government officials at the national level are conversant with the meaning and intention of various policies, their counterparts at the provincial level – the policy implementers directly responsible for transmitting information to intended stake holders – have scant knowledge of these policies.

c. Reaching intended stakeholders: knowledge that is held by policy makers is not reaching the intended stakeholders, including policy implementers (such as extension officers) and users (farmers).

6.2 Challenges for uptake and integration of research findings into policy (PHM, agriculture sector)

The challenges for uptake and integration of research findings are as follows:

a) Lack of quantified and qualified data on crop losses for smallholder farmers in South Africa: This is critical, because it points to the lack of impact assessments reflecting on the extent to which targets have been met in response to policy requirements (quantification) but also on the benefits or quality of service that would have accrued (qualification).

b) Lack of data on performance of various policies that could determine whether policies related to climate change, crop production and post-harvest management are realizing their intended goals and objectives. Most smallholders do not keep operational records, even for outcomes directly related to government intervention such as Temo/Ilima.

c) Lack of regular revision of polices to maintain relevance and to avoid functional overlaps in implementation by various government agencies.

6.3 Possible policy 'spaces' and opportunities for improved implementation of research findings

Several opportunities exist for improved uptake of research findings:

a) Development of risk reduction strategies through increased focus on post-harvest management disasters. At present, national and cross boarder policies are in place that target climate change especially as it relates to human safety. South Africa needs to develop strategies that would mitigate the plight of smallholder crop farmers facing disasters such as drought. Present strategies are skewed towards addressing disasters affecting smallholder livestock production, such as feed-provision during drought periods.

b) Increased disaster preparedness facilitating early response that could be achieved through community empowerment. The development of structures that are well informed about climate change response strategies at the village or ward level would be critical in providing concrete evidence of climate change disasters to relevant government agencies which could trigger immediate responses.

c) A more systematic post-harvest management policy and implementation that would involve all stakeholders, especially smallholders. For example, smallholders in South Africa do not currently participate in membership to organizations that influence post-harvest management policies and the export market.

d) Increased preparedness to react to fire risk to militate against its potential to destroy whole crops and thus create food insecurity in the medium term. While fire risk is infrequent in South Africa, mostly triggered by human activities, its impact is nevertheless disastrous in that whole crops could be destroyed.

7. Conclusion and recommendations

7.1 Conclusions on major policy gaps for crop production and post-harvest loss management and key challenges to implementing policies

The key crop production and post-harvest loss management policy gaps can be summarized as follows:

a) The Government institution focusing on post-harvest loss management needs to be restructured. At present it has other functional areas rather than being a stand-alone and visible operational unit that could clearly address challenges facing smallholders.

b) There is a need for post-harvest management policies that would solely focus on smallholders.

c) The use of biotechnology to mitigate increased carbon emissions needs to be investigated, especially as it might contribute towards increased crop production and reductions in post-harvest losses.

d) There is a need to provide an enabling environment that supports adaption to climate change. While most smallholder farmers are aware of climate change disasters, they are generally not knowledgeable about the causal factors, such as greenhouse gas emissions, which negatively affect mitigation strategies such as introducing drought tolerant crop varieties.

Key challenges to implementation of policies for smallholder farmers include:

a) Capacity constraints at provincial government level. Provincial governments have called for workshops directed at extension officers dealing directly with smallholder farmers.

b) Mismatch of national - policy formulation - and provincial - policy implementation. Policy formulators and implementers need to engage each other before implementation to ensure uniform understanding and application.

c) Skewed focus of present policies on humanitarian aspects. This needs to be balanced with crop production and post-harvest management.

7.2 Major gaps in key institutions and institutional arrangements

The following major institutional gaps were identified by the study:

a) Different levels of government are not integrated in their programs. Such integration is critical not only in harmonizing governmental intervention strategies but also in prevention of overlaps to the affected stakeholders.

b) Post-harvest management institutions are lacking, especially for smallholder famers. This could understandably be attributed to low levels of production for local and

international markets from this sector. Key informants in this study attributed low productivity of smallholders in South Africa largely to the lack of markets and competition from established commercial farming.

c) Smallholders and institutions of higher learning are excluded or minimally included in formulating policies related to climate change, crop production and post-harvest management of crops. This is critical for anticipating climate change disasters and thus developing mitigation strategies.

d) Smallholders lack skills to manage and provide information. Relevant government agencies know little about smallholder production records. It is ironic that the DTI, custodian of the cooperative sector in South Africa, does not have records of the number and actual activities of the various cooperatives, despite massive funding to the sector.

7.3 Opportunities that remain untapped

The following opportunities remain to be explored:

a) There is a need to investigate the effect of increased crop productivity on greenhouse gas emission, given the observation of this study that the amount of land given to crops has shrunk while output remains constant or increases.

b) To what extent could smallholders use existing technologies to address climate change, crop production and post-harvest loss management? Smallholders do not only rely on primitive technologies in their farming ventures, but as the sub-Saharan study reveals, smallholders are generally experiencing massive post-harvest crop losses.

c) There is a need to investigation anticipated carbon taxation vs. free-riding. Some sectors of the economy are more affected than others, while some are completely exempt.

7.4 Suggested way forward regarding untapped opportunities

A) Exploration of shrinking cropland vs. Land use intensity: The first step would be to obtain a provincial-level database of commercial farms in South Africa through the various farmers' unions. Selected farms would be surveyed regarding land use, productivity levels and input application. The survey will consider the amount of land used over a period of time, what the released land was used for, and the level of intensification, especially the use of gas emitting fertilizers.

B) Investigating the extent to which smallholders could use existing technologies to address climate change, crop production and post-harvest losses: this would involve a survey of selected smallholders in the various provinces, especially those that are mainly rural based. The survey will unearth existing technologies for crop production, climate change mitigation and management of post-harvest losses that are already in use, as well as investigating knowledge of modern technologies and the extent to which these are applied in practice. Investigate

anticipated carbon taxation vs. Free-riding. The first step would be to identify the institutions that are either potential or actual implementers of the policy and those that are exempted. It would seek to uncover issues of concern raised by affected institutions compared to those that are not, especially the extent of gas emissions produced by the latter.

7.5 Proposed innovative institutional arrangements

Key institutional arrangements proposed include:

a) An integrated structure that would incorporate all stakeholders from government departments that look into issues of climate change, crop production and post-harvest management, from farmer organizations (including those targeting smallholders), from NGOs and from institutions of higher learning throughout the country.

b) Sub-committees that would integrate the various policies and continually assess implementation and achievement of goals, including revisions of policies after set time periods.

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Annexure: Organization, name and contact details of key informants

ORGANIZATION		NAME	CONTACT DETAILS
1	University of Venda: Environmental Sciences, Climate Change Department	Mr E Kor	015 962 8000
2	University of Venda: School of Agriculture, Forestry Department	Mr S Mwihomeke	015 962 8000
3	Geluksfontein Farmers' Cooperative	Mrs N Monama	0725147064
4	Limpopo Department of Agriculture: Agribusiness division	Mr ML Matiba	0837798512
5	Limpopo Department of Agriculture: Agribusiness division, natural resources Division	Mr Malibe	015 295 3000
6	University of Venda: School of Agriculture Family Ecology (food Security): Female Farmer of the Year award winner.	Dr MP Masipa	015 962 8630
7	University of Venda: School of Agriculture, Department of Plant Production	Dr Gwata	015 9628000
8	University of Venda: Agricultural Economics and Agribusiness	Prof AFDK Anim	015 962 8000
9	Geluksfontein Farmers' Cooperative	Mr P Mokgehle	0827253664
10	University of Venda: School of Agriculture, Department of Plant Production	Dr E Kunjeku	015 962 8000