The potential for integrating DFID-funded Crop Post-Harvest Programme outputs into small-scale food production systems in South Africa's Northern Province

Department for International Development (DFID)

Crop Post-Harvest Programme

Final Technical Report

Project R7777

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Collaborators:

Northern Province Department of Agriculture and Environment, SA (NPDAE)
Natural Resources Institute, UK (NRI)
Agricultural Research Council, SA (ARC)
University of the North, SA (UNIN)
University of Venda, SA (UNIVEN)

EXECUTIVE SUMMARY

This project was funded by the Department for International Development's Crop Post-Harvest Programme.

This study aims to improve household food security in rural South Africa by analysing the post-harvest constraints and opportunities to rural livelihoods in the Northern Province of South Africa.

The major activity conducted was:

- Participatory Rural Appraisal survey in three districts of the Northern Province (Northern District, Lowveld District and Southern District) to determine how the post harvest constraints influence the livelihoods strategies of rural households.

The survey itself revealed largely major pre-harvest constraints such as lack of tractors, implements and fencing. The questionnaire survey was specifically focussed on post-harvest constraints. These were mainly insect pests and diseases, rodents and the constraint of transporting the harvest from the field to the home. Projects from the Crop Post-Harvest Programme from neighbouring countries as well as other recommendations especially made during the mid-term workshop have been proposed to address these constraints in the coming year

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ACKNOWLEDGEMENTS

We would like to thank the communities of Basani, Nkomo-B, Mahlathi, Dididi, Mapate, Vhurivhuri, Bloublommetjieskloof, and Ga-Phaahla as well as the NPDAE field extension staff, for their hospitality and willingness to participate and share their wealth of experience during this participatory appraisal.

Thanks to Paulo Ficarelli (BASED) who assisted in obtaining the scarce existing literature about livelihoods in the Northern Province, and Margaret Kieser of the GIS Unit, PPRI, for drawing the maps.

We would like to thank the UK Department for International Development (DFID)[1] for funding this research project.

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ACRONYMS AND ABBREVIATIONS

ARC	Agricultural Research Council
ARC-CO	ARC-Central Office
ARC-GCI	ARC-Grain Crops Institute
ARC-IAE	ARC-Institute for Agricultural Engineering
ARC-ISCW	ARC-Institute of Soil, Climate and Water
ARC-PPRI	ARC-Plant Protection Research Institute
ARC-Roodeplaat	Institute on vegetable research
BASED	Broadening Agricultural Services & Extension Delivery Project (GTZ)
CAD	Community Agricultural Division
CIMMYT	International Maize and Wheat Improvement Centre
CPHP	Crop Post-Harvest Programme (of DFID)
DBSA	Development Bank of Southern Africa
DFID	Department for International Development (United Kingdom)
GGP	Gross Geographic Product
GTZ	German Development Co-operation
HDI	Human Development Index
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
MTW	Mid-term Workshop
NAFU	National African Farmers Union
NDA	National Department of Agriculture
NPDAE	Northern Province Department of Agriculture and the Environment
NRI	Natural Resources Institute
NR International	Natural Resources International
NTK	Northern Transvaal Co-operative
PRA	Participatory Rural Appraisal
SADC	Southern Africa Development Community

1. BACKGROUND INFORMATION

1.1 Objectives of the study

This study aims to improve household food security in rural South Africa, by analysing the post-harvest constraints and opportunities to rural livelihoods in the Northern Province of South Africa. It is hoped that some of these constraints may be addressed through the adaptation of appropriate solutions developed to address similar constraints in neighbouring countries. The project was developed collaboratively by the Agricultural Research Council Plant Protection Research Institute (ARC-PPRI), the Northern Province Department of Agriculture and the Environment (NPDAE), the University of Venda, the University of the North and the Natural Resources Institute (NRI). It was funded by the Crop Post-Harvest Programme (CPHP) of the United Kingdom's Department for International Development (DFID).

1.2 Methodology

1.2.1 Survey team

Training

During June 2000, NRI from the United Kingdom facilitated near Elim a two-week post-harvest participatory needs assessment training workshop. South African collaborators where trained in appropriate needs assessment survey techniques, including a selection of participatory rural appraisal (PRA) tools for use with groups of the community. A complementary but more focused questionnaire for collection of household and individual level information was also developed, field-tested and amended. As part of the training, participatory post-harvest needs assessments were made in two villages. These two villages were Dididi in the Northern District and Mahlathi in the Lowveld District. Eight members of the training group, representing the NPDAE, the Extension from Northern District and Lowveld District, the University of Venda and the Agricultural Research Council (ARC), formed two teams of four each to conduct the actual survey.

The field survey teams

Ms E. Lundall-Magnuson, ARC-PPRI
Mr T. P. Nyamande, NPDAE, Northern District
Mr K. F. Hlangwani, NPDAE, Lowveld District
Mr R. Randela, ARC-Central Office (ARC-CO)

Ms M. Mosala, University of Venda
Mr T. V. Mugogovhali, NPDAE,Northern District
Mr M. R. Mavasa, NPDAE, Lowveld District
Mr E. F. von Maltitz, ARC-PPRI

1.2.2 Survey period

The survey was undertaken during the out-of season winter period (August - September 2000), after harvesting was completed and before the rain season when planting commences. The actual survey took place in the week from the Monday to the Friday on the following dates:

Lowveld Distict: Basani and Nkomo-B: 31 July - 4 August 2000
Northern District: Mapate and Vhurivhuri: 28 August - 1 September 2000
Southern District: Bloublommetjieskloof and Ga-Phaahla: 11 - 15 September 2000.

1.2.3 Survey area

Three of the Northern Province's seven Districts were selected for the survey at pre-survey meetings held with the NPDAE in Pietersburg. These three Districts are Northern District, Lowveld District and Southern District (Map 1), which have the highest populations of small-scale or resource-poor farmers, who produce crops on a subsistence basis. The yield of these crops is stored, mostly at home and often in a self-constructed granary. Two villages/communities from each district were randomly selected for the survey, one closer to an urban area or major roads and one further than 10 to 15 km from these infrastructures. The selection process is described in Appendix 1 "Random selection of survey villages".

Villages selected:

District		Closer than 10 - 15 km		Further than 10 - 15 km	
Northern	1st choice	Mapate (Mpate)	22° 59 S 30°21 E	Vhurivhuri	22°42 S 30°46 E
	Back-up	Lunungwi	22°55 S 30°23 E	Matangari	22°47 S 30°32 E
Lowveld	1st choice	Basani	23°21 S 30°32 E	Nkomo B	23°25 S 30°47 E
	Back-up	Bongwani	23°12 S 30°43 E	Mothele	23°30 S 30°35 E
Southern	1st choice	Ga-Phaahla	24°41 S 29°44 E	Byldrift *	24°31 S 29°30 E
	Back-up	Masite	24°19 S 29°41 E	Malogeng **	24°20 S 29°46 E

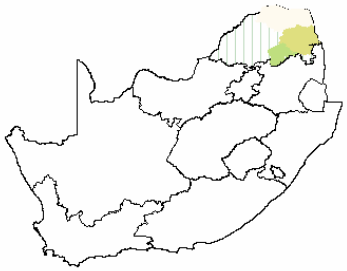
* The village of Byldrift was replaced with its back-up due to an agricultural show to be held in the area in the same week as the scheduled survey.
**The Malogeng village forms part of the Bloublommetjieskloof Service Centre, and it was decided to incorporate the whole Centre in the survey as the three villages, Malogeng, Modimolle and Diamand, which operate as one community.

1.2.4 Pre-survey visit

Prior to the survey, visits where made to each selected village. Mr R Ramugondo (NPDAE, Pietersburg) made the arrangements for the visits. On the pre-survey visit, delegates from the District (and/or sub-regional) offices and Mr E von Maltitz of ARC-PPRI accompanied Mr Ramugondo to the District offices and the offices of the tribal authorities of each village. The aim of the pre-survey visit was to:

- Meet the heads of agriculture of each region to be surveyed;
- Meet the NPDAE officials involved in the community (extension officer, supervisor and technician);
- Meet together with these officials, the tribal authorities (chief, headman, council and or designated representatives) and/or the Civic organisation of the communities selected;
- Indicate the aims of the survey, the process of the survey, the weekly programme, all activities related to the survey and the individual questionnaire;
- To reserve a date and time to introduce the survey team to the authorities; and
- To seek permission and the blessing of the authorities for being able to work in each community

SOUTH AFRICA
Crop post-harvest project of Northern Province

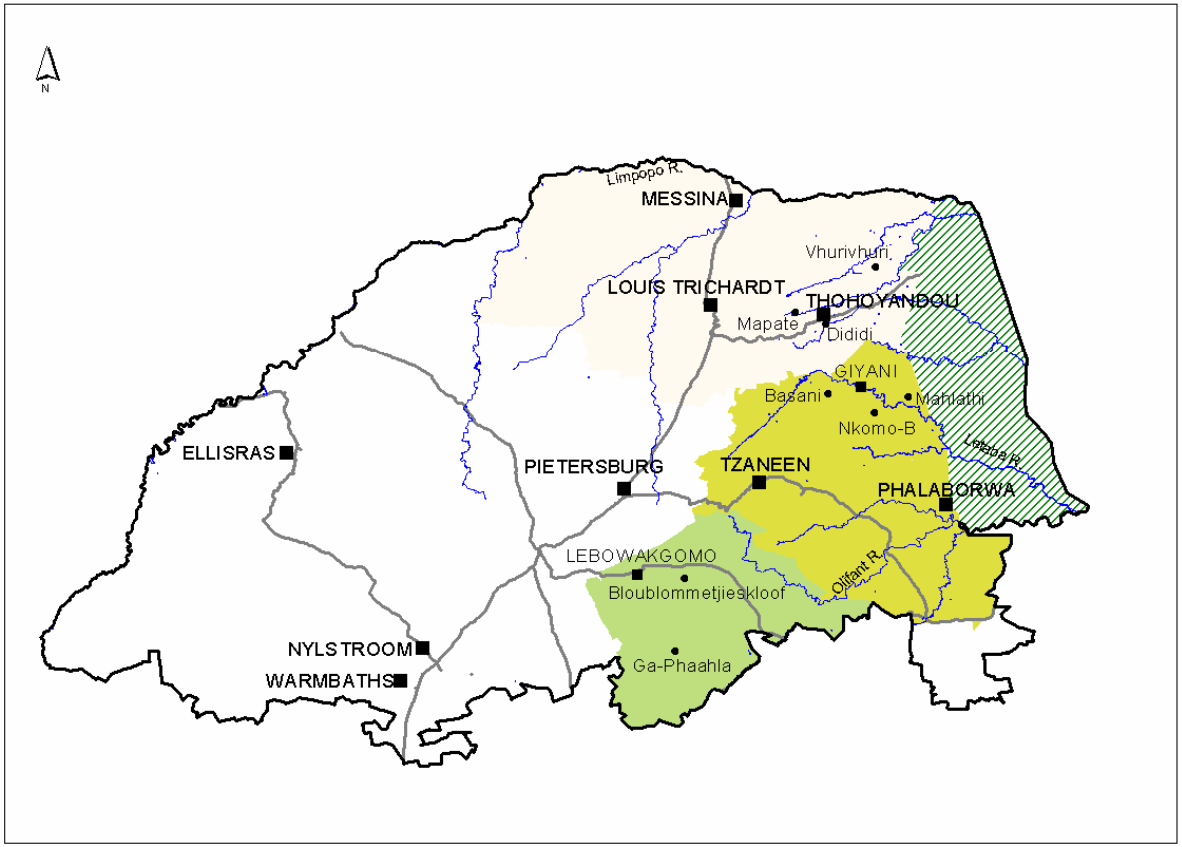


Northern District
Lowveld District
Southern District
Kruger National Park

ARC • LNR

PPRI
P/Bag X 134, Pretoria 0001

Drawn by: ME Kieser
GIS Unit
February 2001



1.2.5 Survey

The week-long survey was divided into 7 different parts:

- Introduction of survey team to the tribal authorities, re-stating aim of survey and activities;
- Introduction of team to the community, explaining aim and proceedings of survey;
- Selection of venue and time in agreement with the community and detail of programme;
- PRA tools for use with groups of the community. These tools focused on:
  Survival strategies; crops grown and related post-harvest activities; seasonal activities and food security; the importance of post-harvest constraints among the general agricultural constraints; information pathways to and from the community; and the identity and role of different stakeholders following harvest. (See attached Appendix 2 "Survey weekly programme");
- Individual household questionnaire (See attached Appendix 3 "Questionnaire") with 30 randomly selected households per village. The questionnaire focused on activities related to the production and storage of the main staple crops.
- Compilation of information and also placing in table format on paper with daily recap to community.
- Recap of the information discussed during the week with the community.

Each week-long survey ran from Monday to Friday. The first day's activities consisted of travelling to the particular village to meet the tribal authority and/or the Civic organisation with the extension officer of the community. From Tuesday to Thursday, the PRA group exercises were done with the representatives of the community, at a time and at a venue selected by them. An ideal number of 30 representatives were asked for, to include as many as possible women farmers as well, but community numbers varied from day to day and from community to community. Women were well represented and in all communities they were the majority represented in the group. Each morning began with a recap of the previous day's information, presented in tables on large sheets of paper. The afternoons were spent conducting the individual questionnaires (a total of 30 per community). Due to progressively declining village representation numbers, it was decided to complete the group exercises in the beginning of the week (when community representation was high), and only do the questionnaires at the end of the week, in the Northern and Southern Regions. This change in the initial programme was successful, saving on the farmer's time to be at a venue for a full four days.

1.2.6 Post-survey

Post-survey activities included compiling the village reports, processing the 180 individual questionnaires into a database, a mid-term workshop, a survey village feedback visit and the writing of the final report for the National workshop.

1.2.7 Mid-term workshop

A workshop was held from 30 October to 1 November 2000 at the Lobethal Church Centre near Marishane in the Southern District. A total of 38 delegates attended the two-day workshop, representing the farming communities of the villages surveyed (both male and female), NPDAE, University of Venda, University of the North, Natural Resources International (NR International, U.K.), NRI, ARC-C0, ARC-PPRI and ARC-GCI (Grain Crops Institute) and the survey team members.

At the workshop, a summary of the survey report was delivered to the delegates regarding the information gathered with the use of the PRA tools in community group exercises. A summary of the findings of the individual questionnaire database was also presented. The village representatives were given the opportunity to amend any details of the report they felt were inaccurate.

A presentation of a selection of Crop Post-Harvest Programme (CPHP)-funded Outputs from neighbouring countries with relevance to the Northern Province livelihoods was presented. These CPHP project Outputs were discussed under the categories of:

- Management of insect pests, rodents and diseases
- Improved storage structures
- Information/knowledge
- Processing
- Horticultural issues
- Credit/financial
- Marketing
- Methodologies

The agricultural constraints as identified by farmers in the three Districts surveyed were categorised under:

- Pre-harvest constraints identified by the survey in the three Districts and
- Post-harvest constraints identified by the survey in the three Districts.

Workshop delegates were divided into mixed background groups and asked to discuss whether any of the CPHP project Outputs might be used to address the constraints identified by the Northern Province communities, and what uptake pathways could be used. The groups were also asked to identify which Northern Province constraints were not addressed by the CPHP outputs, and to discuss potential ideas/solutions for addressing these constraints. The outcomes of these discussions are shown in Appendix 4 "CPHP projects".

1.2.8 Feedback visit

A feedback visit to the survey villages was held during the week of 29 January to 2 February 2001. Although a few selected community members (both farmers and the local NPDAE extension officers) had attended the mid-term workshop, there was a need for a feedback visit to the communities surveyed. The surveyed communities were updated on the progress of the survey and on the outcome of the mid-term workshop. Potential, locally acceptable solutions for the constraints listed in general by the communities were also discussed. The communities were again offered the opportunity to amend any information they felt was inaccurate, but they did not do so as they felt the data was valid.

1.3 Overview of Northern Province

In the South African political dispensation from 1994 onwards, the country was divided into nine Provinces, each with its own Provincial government, including a Provincial Department of Agriculture (PDA). The National Department of Agriculture (NDA) is still the central body overseeing and determining agricultural policy matters of national interest, whereas the Provinces are responsible for the management of all agricultural matters of local importance (Agricultural Digest 2000/2001, 1998).

The first significant achievement in terms of agricultural policy was the deregulation of the marketing sector to bring it in line with the social and economic democratisation of the country and with international trends towards deregulation. During the transformation process, greater emphasis was placed on small-scale developing agriculture. Significant progress has been made in areas of land reform, access to credit and market opportunities.

Various problems affecting agricultural performance remain: scarcity of water resources; desertification; soil erosion; soaring input costs; crime; and rapid population growth. The Government faces the challenge of reconstructing smallholder agriculture in order to improve household food security, to empower women farmers and to encourage the involvement of young people in agriculture (Agricultural Digest 2000/2001, 1998).

1.3.1 Historical background

The Northern Province comprises of what used to be called the Northern Transvaal, Venda, Lebowa, and Gazankulu "homelands", as well as being known as region D. As a consequence of *apartheid*, almost the total population of the then Northern Transvaal region was settled in rural areas of the three "homelands". According to the Development Bank of Southern Africa (DBSA) (1993), 91% of the population was settled in rural areas, with the remaining 9% in the urban areas. Most urban settlements are informal and there are no metropolitan centres. The majority of urban dwellers in the Northern Province are found in Pietersburg, Tzaneen/Nkowankowa, Phalaborwa/Lulekani/Namakgale and Louis Trichardt. A range of secondary urban centres also plays a significant economic role, such as Nylstroom, Warmbaths, Messina, Thohoyandou and Ellisras (Map 1). This network of urban centres offers the best opportunities for sustainable development and potential economic co-operation with the rest of Southern Africa (Rwelamira, 1997)

1.3.2 Geographic orientation of the Northern Province

The Northern Province of the Republic of South Africa is located in the northeast part of the country. The Province is adjacent to three other Provinces, namely, Northwest Province, Gauteng and Mpumalanga and borders Botswana, Zimbabwe and Mozambique. It covers an area of 123910 km^2 (12,5 million ha), representing 10% of the total area of South Africa (Statistics South Africa, 1995).

The Province is divided into seven Districts; viz. Northern District, Lowveld District, Central District, Southern District, Western District, Bushveld District and Bushbuckridge District. The Districts are further divided into sub-regions. The geographical location of the Northern Province places it at the forefront of South Africa's potential economic co-operation with the rest of the southern African countries.

1.3.3 Natural resources[2]

Topography

The Northern Province can be split into several topographic zones. In the east, there is a flat to gently undulating lowveld plain, at an altitude of 300 to 600 m, bounded in the west by the northern Drakensberg escarpment and Soutpansberg, with steep slopes and peaks up to 2 000m. The almost level Springbok flats in the south lie at an altitude of 900 m, while the Waterberg and Blouberg to the north, with undulating to very steep terrain, reach 2 000 m. The north-west zone is a flat to undulating plain, which slopes down to the north and west, at 800 to 1 000 m.

Climate and agro-ecology

The Province falls in the summer rainfall region (Table 1.3.1). The lowveld area is hot and dry, with no frost and an average rainfall of less than 500 mm per annum. The mountains are cooler and wetter, reaching 1 500 mm or more rainfall in places. To the north-west, the rainfall varies from 600 mm on the Springbok flats to less than 400 mm on the Botswana border, where it can be extremely hot in summer. Dry-land cultivation can only be practised on the Springbok flats and on the eastern escarpment and its foothills (Map 2 "Rainfall").

Table 1.3.1 Average rainfall in mm for Pietersburg, Northern Province (Weather Bureau, 2001)

	Average rainfall in mm 1961 - 1990: Pietersburg											
Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	82	60	52	33	11	5	3	6	17	43	85	81

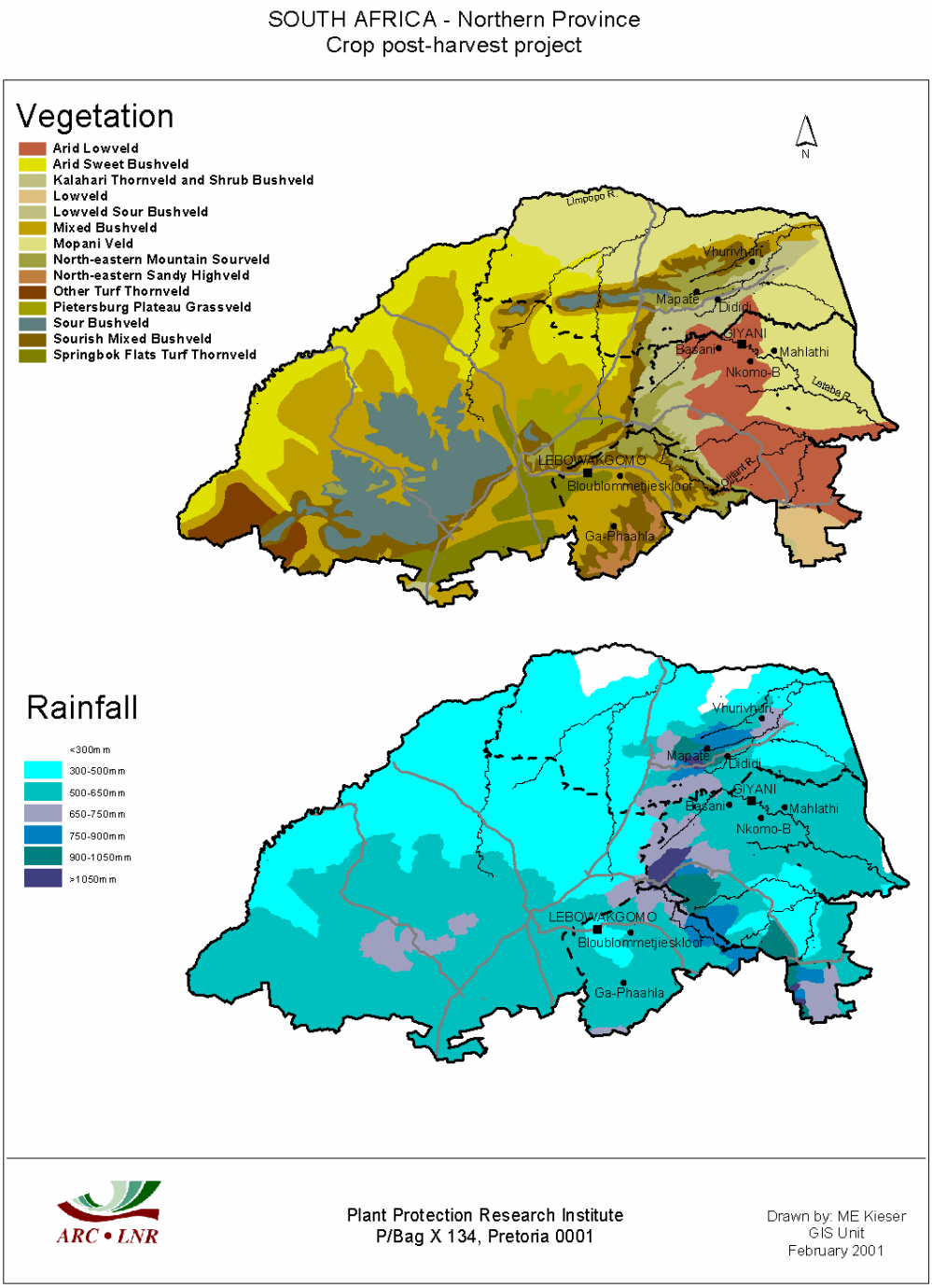
Water

The major rivers are the Limpopo in the north, and the Olifants and Letaba further south, all of which drain eastward. The Limpopo only flows strongly occasionally, while the Olifants and Letaba are heavily utilised for irrigation, especially east of the escarpment. Most of the Province is very dry, however, with few large dams. Drought is an ever-present threat in the north, and the rapidly growing human population is placing increased pressure on existing resources, especially in the Letaba catchment area. Thus drought management strategies need to be developed that will aim at reserving and saving water as well developing drought resistance technologies.

Soils

Black and red, fertile clay soils occur on the Springbok flats, with reddish-brown sandy loam to the north and west. The mountains have deeper, highly leached red soils in the wetter areas, with exposed rock where the climate gets drier. Reddish-brown, gravely soils which have low fertility, predominate in the lowveld, with the best agricultural soils being alluvial soils next to most of the rivers. The Province does not have much high potential agricultural soil.

[2] This information is based on work done by the Northern Province Department of Agriculture and the Environment



Map 2 Northern Province indicating vegetation types and rainfall zones.

Vegetation

John P. H. Acocks mapped the vegetation types of South Africa from 1945, and this work has since become the standard reference to the ecological scene in South Africa (map 2 "Vegetation"). Seventy Veld types with as many variations are recognised on broad lines. Although vegetation changes according to the way it is treated, the following six Veld types of two of the major Veld groups from the 1988 edition of Acocks' Veld types apply to the areas surveyed for this project in the Northern Province. The two major Veld groups are the Bushveld and the Inland tropical forests. A third major Veld group, the Grassveld, is also evident in the Southern District at high altitudes. The villages surveyed are added in bold in each Veld type.

Tropical bush and savanna types (Bushveld)

Mopani veld – This runs north of the Soutpansberg and as a broad belt running south from the eastern part of the Soutpansberg nearly to the Olifants River and including the northern part of the Kruger National Park. The eastern belt is wetter, with taller and more mixed vegetation. The dominant tree is *Colophospermum mopane* (completely dominant in parts such as at **Mahlathi** village) while in the main valleys (both Letaba rivers) the bush is more mixed (*Acacia tortilis* and other acacias, *Combretum apiculatum*, *Sclerocarya birrea*) with riverside growth of *Acacia karroo* and *Panicum maximum.* The grass layer is reduced to *Eragrostis* sp, together with annuals like *Aristida congesta* and *Enneapogon cenchroides*. The use of the mopani tree is evident as in the building of large and more than one-m high thatched granaries, the *nturuka*, under which the kitchen hearth is placed.

Arid Lowveld - Typically an *Acacia nigrescens-Sclerocarya-Digitaria* savanna with stunted *Colophospermum mopane* in parts, providing a transition to Mopani veld (such as at **Nkomo-B** village). The mixed Digitaria grass veld breaks down to *Eragrostis* sp. and *Aristida congesta* under grazing pressure e.g. **Basani** village.

A combination of Mixed Bushveld and Sourish Mixed Bushveld - The Mixed Bushveld is a maze of variations and transitions, with its eastern part between the Olifants and Steelpoort valleys being very mixed. It may be characterised as *Acacia nigrescens-Combretum apiculatum-Kirkia wilmsii* Veld (**Bloublommetjieskloof**). Much of it is norite and the grass may be of a sweeter type than that to the west and the valley scrub related to Arid Lowveld. The Sourish Mixed Bushveld occupies the gentle slopes of the mountains. It is generally an open savanna with *Acacia caffra* as the dominant tree within a dense grassveld dominated by *Cymbopogon*, *Elionurus* and *Hyparrhenia* spp in sandy loam soils, breaking down to *Eragrostis*, *Digitaria* and *Aristida* spp. Strips of North-eastern Sandy Highveld (a Grassveld type) with Bankenveld affinity occurs at higher altitudes (**Ga-Phaahla** village) where the sourer *Tristachya* and *Trachypogon* spp are more dominant than *Themeda* grass. Owing to the limited number of trees, grain was never traditionally stored in granaries constructed of wood, and instead was placed in underground chambers or in woven-grass baskets such as the *seshego*.

Inland Tropical forest types

Lowveld Sour Bushveld - This veld type covers the lower eastern slopes of the mountains of the Drakensberg and the Soutpansberg (**Dididi** village). It is transitional between the Lowveld and North-eastern Mountain Sourveld with bushveld dotted with big trees. Common trees and shrubs include *Trichilia emetica*, *Sclerocarya birrea*, *Acacia* spp.,

Ficus spp. *Terminalia sericea* amongst others. Belts of forest occur along the rivers. The grassveld constituent is tall and sparse, with scrubbiness; species include *Hyperthelia dissoluta*, *Heteropogon contortus* and *Aristida congesta*. It is sourish, mixed of nature, and of poor quality for grazing. Localised soil erosion occurs in this veld in the form of dongas (gully's or small ravines), some very old.

North-eastern Mountain Sourveld – Usually associated with high rainfall areas. The forest was originally high and tropical, but most of it has been replaced by sour grassveld, which is pure on the mountaintops, but a scrubby thornveld on the slopes. Trees, shrubs, climbers and smaller plant species are relatively abundant. The sourveld replacing the forest is strongly *Themeda*-dominated. Much of this veld type has been replaced by plantations of pines and bluegums, such as to the west of **Mapate** village. In the Lambwe River valley (**Vhurivhuri** village), this veld merges into Sourish Mixed Bushveld, an open savanna with *Acacia* and dense grassveld dominated by *Cymbopogon plurinodis* and *Themeda triandra* in sandy loam soils. The use of wooden poles for the *dulu* type granaries (raised less than one m) is evident in these areas.

Land–use

Of the estimated total of 12.5 million ha, 67% (8 million ha) is utilised as agricultural land. Of this, 8 million ha of agricultural land, or nearly 10% (0.8 million ha) is utilised as arable land, 67% (5.4 ha) as natural grazing, 18.4% (1.5 million ha) for nature conservation, 1.1% (0.088 million ha.) for forestry and 2% (0.16 million ha.) for other purposes. About 76% of arable land (0.61 million ha) is allocated to dry-land cultivation and forms the most important kind of cultivation occurring in the Northern Province.

1.3.4 The Economic Performance of Northern Province

The Northern Province is rich in minerals, including copper, asbestos, coal, iron ore and platinum. The Province exports primary products, and imports manufactured goods and services. Unemployment is high (41%). The per capita income is by far the lowest in the country (South Africa Year Book, 1999). The per capita disposable income is an average of R2 112, but as low as R1 543 for Blacks. A study by Rwelamira (1997) estimated that three quarters of rural households subsist below the poverty line of R900 per month, while one in four households managed on less than R800 per month. Many inhabitants earn their livelihood as migrant workers in Gauteng.

The Province's source of economic activities is centred principally around the mining sector. Agriculture is the second largest sector of the Province's economy and includes both a commercial and smallholder sector. Production in the latter sector is characterised by subsistence production, mainly of staple crops (maize and sorghum) and vegetables. It is not surprising that the two sectors, mining and agriculture, are the main source of economic activities since they both have the highest location quotient[3] of 2.4 and 2.1**,** respectively (DBSA, 1991, as cited by, Rwelamira, 1997). Other production activities include trade, manufacturing, transport, communication, electricity, finance and services.

[3] A location quotient larger (*or less*) than 1 indicates that a Province possesses a comparative advantage (*or disadvantage*) in the production of a specific commodity.

The Northern Province contributed only 3.9% to the Gross Geographic Product (GGP)[4] in South Africa during 1993. The biggest contribution to the GGP in the Northern Province in 1993 was the tertiary sector, consisting of trade, finance, community services, Government and other producers. The primary sector, consisting of the agricultural and mining sector, was the second biggest contributor to GGP, with 32.7%. Of this, agriculture contributed 9.6%. The largest role player in the Province was the Provincial Government, which contributed 27.3% of the GGP (Department of Agriculture, 1996).

An examination of the economic sector by "Statistics South Africa", in 1995, shows that a large proportion of jobs are found in the tertiary industries. 42 % of those employed in the Northern Province work in the personal services sector. This percentage is higher than the national mean figure of 31%. An additional 17% work in trade, catering and accommodation. The agricultural sector provides jobs for 15% of the employed, 6% work in the mining industry and 5% work in manufacturing.

1.3.5 Social and cultural aspects

Statistics South Africa (2000) estimated the total population for the Northern Province to be 4 929 368 in 1996, with the total South African population being 40 583 573. This makes the Northern Province the fourth-most populated Province, after Kwazulu-Natal, Gauteng and Eastern Cape. The vast majority of the Northern Province population are Blacks (97%), Whites (2.4%), and the remainder consists of Coloureds (0.2%), Indians (0.1%) and other unspecified population groups (0.7%). Males constitute 46% of the population, while women constitute 54%.

Sepedi is the home language of 52% of the population, followed by Xitsonga (22%) and Tshivenda (15%). The rest of the population speak Afrikaans and to a lesser extent English, Isindebele, Isixhosa, Isizulu, Sesotho, Seswati and Setswana (Statistics South Africa, 2000). The inhabitants of the Northern Province have a life expectancy at birth of 62.7 years which is similar to that for the whole country (62.8). According to "Statistics South Africa (1995)", the adult literacy rate (persons 15 years and older who can read, write and speak their home language) is 74% compared with the national figure of 82%. Most Coloureds, Indians and Whites live in urban areas – 92%, 92% and 69%, respectively. This contrasts with the Black population, of whom only 8% live in urban areas.

Human development levels in the Northern Province are determined by spatial and racial disparities. According to DBSA (1996), human development levels of the White population in the Northern Province range between 0.91 and 0.96, which compare well with the top 25 countries of the world. However, the highest human development index[5] for the Black population is 0.40 in Thohoyandou and Namakgale, and the lowest is 0.25 in Letaba.

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[4] Gross Geographic Product (GGP) refers to total production of final goods and services in a geographic area (such as a Province) during a particular period.

[5] Human development index (HDI) is a measure of people's ability to live a long and healthy life, to communicate, to participate in the community and to have sufficient means to be able to afford a decent living. The index has three basic components; longevity (measured by life expectancy at birth); knowledge (measured by adult literacy and average years of schooling); and income (measured by GDP per capita). The HDI can vary between 0 and 1, where 0 corresponds with the minimum value of the indicator and 1 with the maximum value.

1.4 Post-harvest stakeholders in the Northern Province

1.4.1 Farmers

Northern Province has a population of 4,9 million people of which approximately 519 000 are farmers and of which women comprise 70 - 80% of the agricultural sector (Agricultural Digest 2000/2001, 1989). During the survey, the tribal authorities and local extension personnel helped to ensure that a realistic representation of farmers from the different wealth groups, tribal backgrounds, age groups, genders present within the communities attended the group exercises. In communities closer to urban areas, many of the villagers have other occupations, although most also do some farming (as a second occupation), or the women are farmers while their husbands have other occupations. In most households at least one member was a farmer. In the more rural areas, most villagers were farmers (first occupation).

From the randomly selected households in the six villages of the three Districts interviewed, it appears as though those villages in the Lowveld District and Northern District closest to town centres or main roads (Basani and Mapate) were more likely to have a male head of the household. On the other hand, the more remote villages had a majority of female headed households (Table 1.4.1). This may reflect the fact that men in more remote villages stay at their place of employment due to transport difficulties while working men from closer to main roads and large towns can travel each day to their place of work. From the 180 households interviewed, 60 % had a male as head of the household.

Table 1.4.1 Gender of head of household of the six villages surveyed in the Northern Province

		Mean no. of households members					Gender of head of household	
District	Village	Adult males	Adult females	Children	Mean total size of household (±sem)	Min/Max no. of household members	Female	Male
Lowveld	Basani	2.30	1.70	3.63	7.63 (0.59)	2-17	7	23
Lowveld	Nkomo-B	1.73	2.47	3.83	8.03 (0.77)	2-25	17	13
Northern	Mapate	1.63	2.07	2.37	6.07 (0.41)	2-10	7	23
Northern	Vhurivhuri	1.07	2.10	3.27	6.43 (0.53)	1-13	18	12
Southern	BB-kloof	1.47	1.87	3.90	7.23 (0.57)	3-16	11	19
Southern	Ga-Phaahla	1.53	1.77	3.10	6.40 (0.53)	1-12	11	19
Total							71 (39.4%)	109 (60.6%)

The land area cultivated by households ranged from 0.14 to 24 ha. Male-headed households tended to cultivate larger areas than female-headed households (Table 1.4.2). The mean cultivated land areas were largest in Nkomo-B (Lowveld District) and smallest at Vhurivhuri (Northern District).

Table 1.4.2 Mean hectarage of land cultivated by farmers of the six villages in Northern Province

District	Village	Mean hectarage (±sem)			No. of households responding about hectarage	
		Male headed households	Female headed households	All households responding	Male-headed	Female-headed
Lowveld	Basani	2.53 (0.26)	2.10 (0.27)	2.38 (0.21)	23	7
Lowveld	Nkomo-B	6.32 (1.84)	3.36 (0.60)	4.64 (0.89)	13	17
Northern	Mapate	2.84 (0.72)	1.54 (0.29)	2.51 (0.55)	21	7
Northern	Vhurivhuri	1.74 (0.38)	0.63 (0.14)	1.09 (0.20)	12	17
Southern	BB-kloof	1.73 (0.26)	1.75 (0.28)	1.73 (0.19)	17	10
Southern	Ga-Phaahla	2.19 (0.25)	2.03 (0.21)	2.13 (0.18)	19	11
Total		2.78 (0.31)	1.93 (0.20)	2.44 (0.20)	105	69

1.4.2 Millers

During the survey, several different mills used by the communities involved, were visited. Each village where dry-land maize was produced had a mill or reasonable access to a mill. Millers ranged from the village miller with a hammer-mill (Plate 1.4.1), to larger mills serving an area of villages and providing transport for farmer and produce to and from the mill on a weekly basis, or the NTK roller mill (Plate 1.4.2) based in Thohoyandou. Of the villages surveyed, only Dididi farmers generally stated making use of the NTK roller mill, while only some individuals at Mapate and as far as Vhurivhuri took their maize to the NTK roller mill. NTK also has roller mills in Pietersburg and Potgietersrus, but the latter two are too far away for villages in the area surveyed. Progress Mills, a Pietersburg-based company, have set up mills in various communities in the Province.

Plate 1.4.1 Miller with hammer-mill in Nkomo-B

In villages without a miller, a mobile mill (hammer-mill on the back of a light delivery vehicle) travelled from neighbouring villages to these villages e.g. Vhurivhuri and Bloublommetjieskloof. Except for NTK that exchanges maize meal flour for maize grain, the millers were not very

concerned about the quality of maize brought for milling. Before milling, millers did check maize kernels for the presence of stones and other foreign objects that could damage their equipment.

One milling constraint mentioned by the Basani village women was the amount of time, which they needed to set aside for milling. A whole day is usually spent en route to and at the mill, preventing them from attending to their other responsibilities and tasks. Transport picks them up early in the morning and returns them late in the day. The busiest times at the mill are following the peak maize harvesting periods and after pension pay-out days. During these peak milling periods, some women mentioned that they frequently had to sleep over at the mill, as their produce had not been able to be milled during the day.

See Appendix 5 “The millers” for case studies.

Plate 1.4.2 NTK Venda roller mill, Thohoyandou, Northern District.

1.4.3 Traders

A variety of traders, ranging from large chain stores in larger towns to spaza shops and free-trade markets near villages occur in the Province. Regarding maize meal and food, the larger shops sell only brand names, while spaza shops and market stalls may sell locally produced goods. Except for green maize, locally produced subsistence maize is seldom sold by farmers in the form of maize meal on the open market. It was stated that " maize is not sold as everyone has enough after harvest, and most farmers produce only enough for themselves". Surplus is also stored. In some cases surplus was sold to neighbours (Basani, Mapate) or was traded for cash with neighbours in emergencies (Bloublommetjieskloof), mostly by women needing the cash to pay for items for their school children or to buy illuminating fuel.

Certain shops in villages neighbouring Bloublommetjieskloof exchanged maize meal (brand name) for shelled maize, but this maize was taken in bulk and sold to a mill rather than being resold as flour.

The M-farm community shops owned by NTK sell maize meal, milled and packaged by NTK and with its own Magnifisan logo. The maize meal may contain locally, small-scale produced maize, but the contribution from commercial farms is larger (see Appendix 6 "Traders" - case study).

1.4.4 Transporters

Transport was a constraint for almost all farmers, whether it was transport of the harvest from the field to the homestead, or from the home to the market. Few farmers owned vehicles. Villagers with vehicles, either donkey carts or light delivery vehicles (bakkies) used their vehicles as a source of income providing transport. Farmers stated that in peak harvest periods, due to lack of competition amongst transporters, the price paid for transport could be very high.

The larger millers provide transport from and to the mill for their clients and their grain produce, at a price already included in the milling cost. This transport functions on a predetermined timetable e.g. on Thursday's Mapate villagers are transported to the mill in Duthuni, and on Tuesday's and Thursday's Basani villagers are transported to the Majosi mill (Plate 1.4.3). Those women needing to mill a bag of kernels on other days have to look for alternative transport, go on foot or process the grain by hand (See Appendix 7. "Transporter" case study).

Plate 1.4.3 Transporting milled maize by wheelbarrow at Basani.

Taxis and buses provide human transport, mainly along predetermined routes. Villagers at Vhurivhuri stated that public transport from their village to Thohoyandou costs R12.50 and R5.50 by taxi and bus, respectively. It is difficult to get transport in the morning and also sometimes impossible to get transport in the opposite direction to the normal traffic flow. The latter is also true for Nkomo-B, where public transport flowed from the rural areas to Giyani in the morning and back in the afternoon.

In cases of emergencies, most villagers also rely on public transport (mostly taxis) to reach the clinic in the larger towns, if there is no clinic in their own or neighbouring village.

1.4.5 Extension services

The headquarters of NPDAE is based in the Provincial capital Pietersburg. This is also where the Head of Extension and Training is based and consists of the three chief Directorates, namely, Regional Services; Support Services; and Environmental Affairs (Fig. 1.4.1). The regional offices of the Department are each based in their respective Districts. The Department has a further 115 service centres and covers approximately 652 wards. The regional offices of the Northern District, Lowveld District and Southern District are based at Sibasa, Giyani and Chuenespoort (Lebowakgomo), respectively (Agricultural Digest 2000/2001,1989).

The regional office of the Northern District is divided into three sections: Veterinary Services; the Environment; and Agriculture. The Agricultural section is divided into four sub-regional offices and each of these offices consists of three divisions; the Technology division with its professional (researchers) and technical staff, the Advisory division with its advisory or extension officers, and the administrative division. An example of a regional office is given for Northern District in Fig. 1.4.2 below. Northern District has four sub-regions, namely Limpopo, Thohoyandou, Zoutpansberg and Levubu/Shingwedzi.

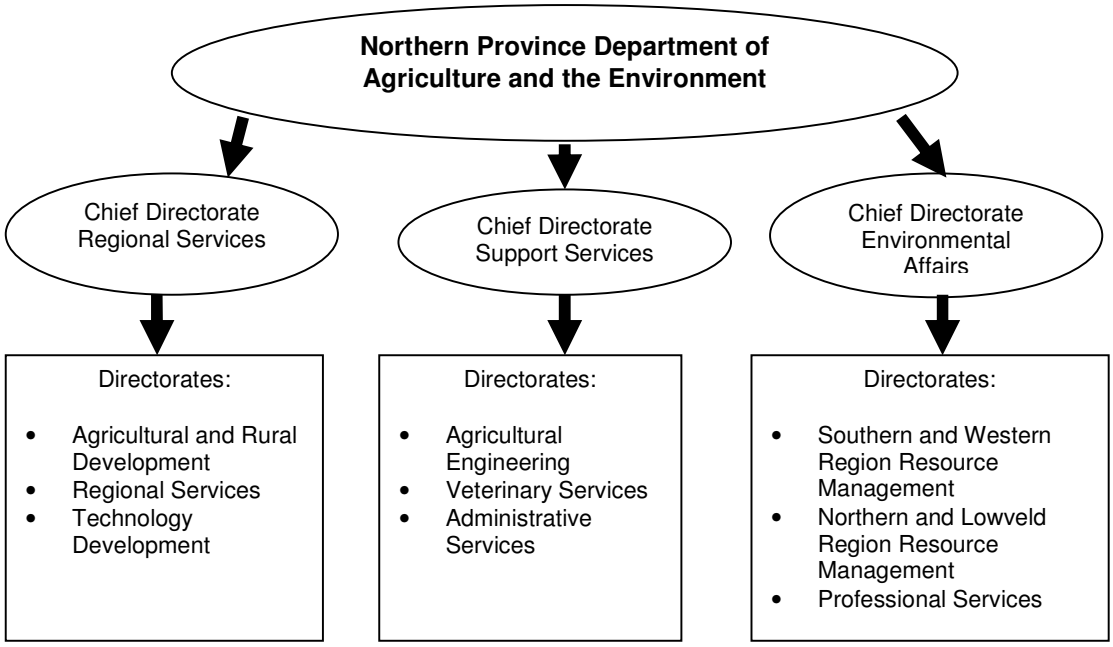


Figure 1.4.1 Chief Directorates and Directorates of NPDAE Extension and Training.

Each of the sub-regions has a number of Service Centres responsible for a number of wards with extension offices manned by one to three extension officers. Each ward consists of four to ten villages. Dry-land areas are the larger areas with more villages, while irrigation areas are divided into four blocks, each with two sub-blocks.

The Lowveld District has three sub-regions, namely, Tzaneen, Phalaborwa and Giyani. The Giyani sub-regional office is based at Giyani and consists of five sections, namely, Advisory, Technology, Infrastructure and Rural Development, Engineering and Administration. This is illustrated in Fig. 1.4.3.

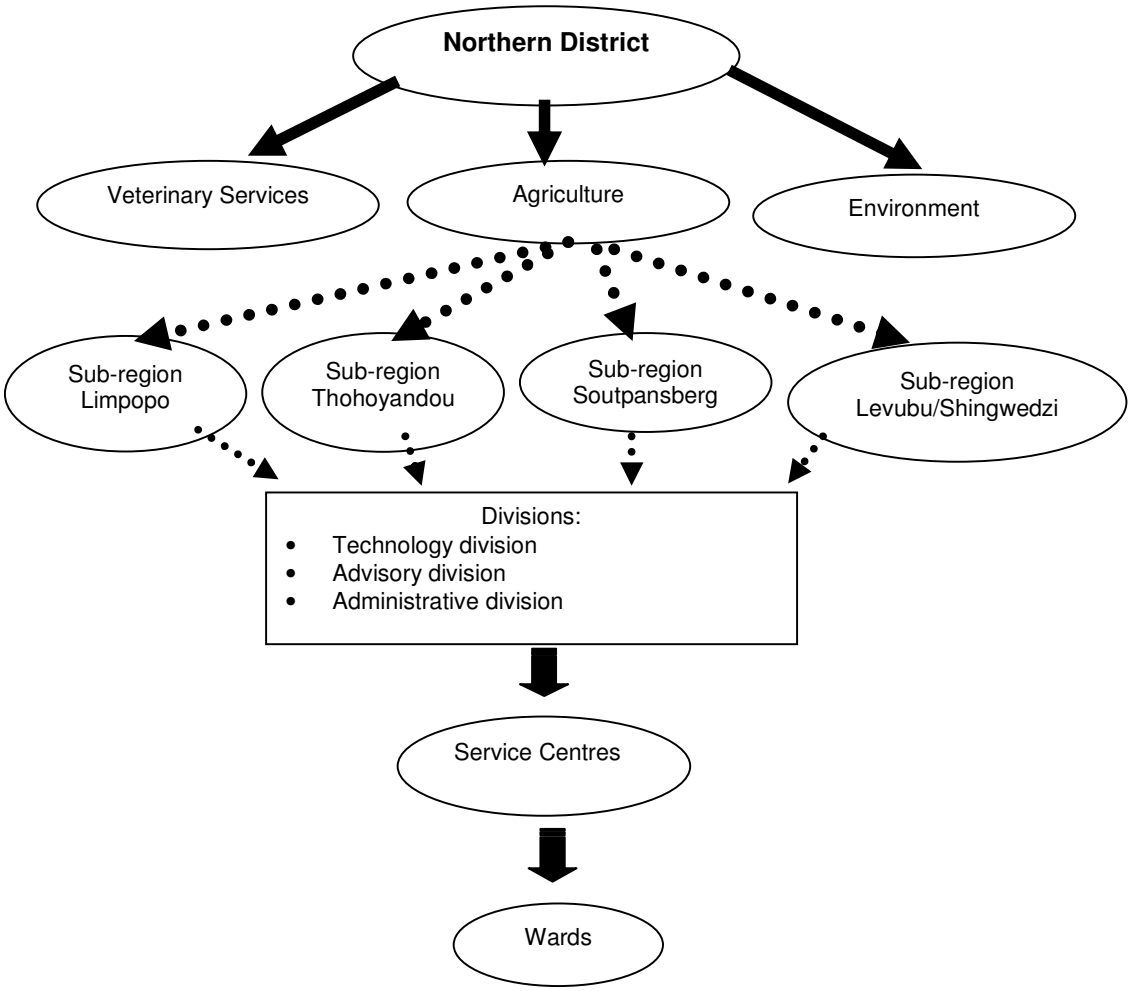


Figure 1.4.2 NPDAE regional office structure of the Northern District

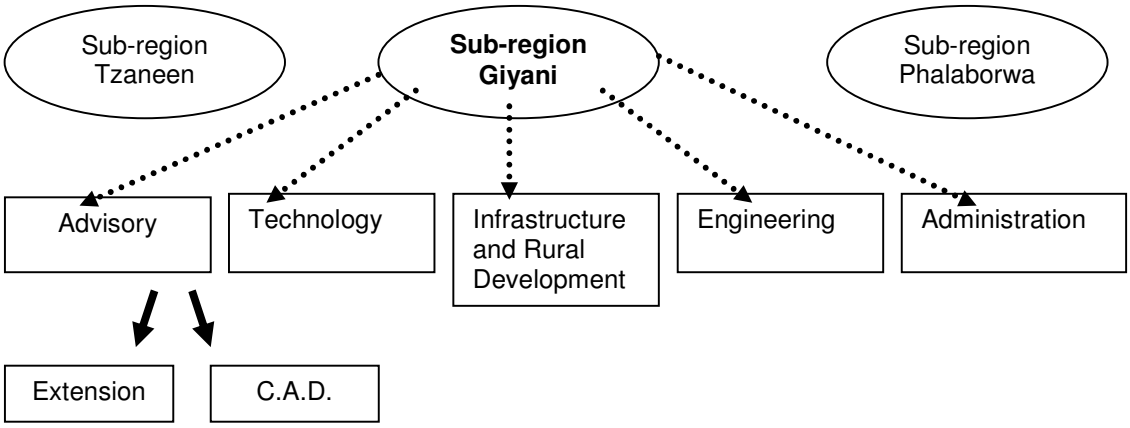


Figure 1.4.3 NPDAE sub-regional office structure of Giyani sub-region, Lowveld District.

The Advisory section consists of the Extension Division and CAD. Each has a number of senior technicians (supervisors) and technicians. Each technician has about five wards consisting of a number of villages under his or her care. The Extension Division caters mainly for true farming activities while the CAD personnel are also involved in community garden projects, sewing, cooking, a mini-bakery and setting up other food-processing projects.

1.4.6 Community-based organisations

Each village surveyed mentioned having a number of community-based organisations. The most common one is the burial society and each village had one or more of them. All villages also have churches of various denominations. Most have sewing and baking or cooking clubs (e.g. *pheladi*), and community gardens. Some have farmers associations, of which the Nkomo farmers are affiliated to the National African Farmers Union (NAFU) and others are formed (and encouraged to form) to buy together farming inputs such as pesticides. Nkomo also had a farmer's co-operative, while the Civic's organisation at Vhurivhuri manages a tourism project. Mapate boasts a choir as well as a revived adult school.

Most communities have various fund-raising organisations to help meet the costs of burials (the burial society) or weddings. However, the Bloublommetjieskloof community stated that although they have many clubs, most do not generate funds. At Bloublommetjieskloof, women sold cosmetics and household detergents as an additional source of income, the items were supplied from outside the community.

Women in most communities belong to a *stokvel*, a banking system, where each member contributes monthly a specified amount and each member in turn receives the total amount of all members contributions for that month.

1.4.7 Projects

Various agriculturally-related projects are on-going in the Province. To list them all would be a project on itself. Projects vary from community-based vegetable gardens providing food security and cash crops, to cultivar evaluations involving small-scale and commercial farmers.

Training and research projects vary from on-farm crop pest and disease management studies of the ARC, (for instance, the "push-pull' strategy used with Napier grass in maize stalk borer management) to the GTZ-funded NGO named Broadening Agricultural Services & Extension Delivery Project (BASED), which supports the NPDAE in developing extension and research.

ARC through its Institutes is involved in socio-economic and research surveys in co-operation with small-scale farmers and NPDAE.

Post-harvest issues are addressed in projects such as:
ARC-GCI's training programme with farmers processing maize with Progress Mills.
The Larger Grain Borer monitoring project of the NDA and the ARC-PPRI.
Development of draught power implements and harvesting implements by ARC-IAE and GTZ
Evaluation of traditional storage pest control systems involving e.g. aloe ash.

The following projects were mentioned by, and directly involved the villages surveyed:

- Most villages have their own cattle dip facilities, and in Basani this is combined with the agricultural show ground including the cattle auction kraals.

- The Nkomo communities also started an agricultural show ground, but this project stopped due to financial constraints and political transition.
- At Mapate, a group of farmers are in the process to set up a nutritious vegetable project, with plans to develop this further into catering and tourism.
- At Lwamondo, a neighbouring village to Mapate, ARC-GCI conducts maize disease screening trials, with the involvement of the farmers from the community.
- The CAD of the Advisory section of Giyani sub-region in the Lowveld District has developed community gardens (Nkomo-B), mini-bakeries, cooking clubs and sun-drying processing projects (Basani), mainly with women from the various communities.
- In the area of Ga-Phaahla, NPDAE manages a Land-Care project funded by Spain. One of the aims of the project is to establish grazing camps.
- At the time of the survey in Vhurivhuri, Statistics South Africa on behalf of the NDA were doing a questionnaire survey "Agriculture 2000". This is to update their statistical base and for developing socio-economic indicators of the situation in rural areas.
- The Ga-Phaahla community mentioned that the University of the North had conducted a storage survey there in the winter season of 2000.
- At Bloublommetjeskloof, a brick-making project was ventured by an NGO, but this project failed due to a lack of finances.

2 SURVEY RESULTS

2.1 Background information on surveyed villages

The following paragraphs provide a brief summary of the history of the eight villages visited during the needs assessment survey[6].

2.1.1 Lowveld District survey villages

The three villages surveyed in the Lowveld District were previously part of the Gazankulu homeland. All three were demarcated as residential areas in 1968.

Basani

The village of Basani originated in 1921. It is estimated that the village has a thousand households. They cultivate demarcated fields of an average 3-ha size, which surround the residential area, and cattle are grazed towards the east of the village. Three language groups, Xitsonga, Northern Sotho (Sepedi) and Tshivenda are represented within the community. Basani is 2 km from the R81 main road from Pietersburg to Giyani and approximately 19 km from the latter. A gravel road through the village links it to the Giyani-Louis Trichardt main road (R578). The two tar roads form the southern and northern boundaries of Basani.

Nkomo-B

The village of Nkomo-B is located next to Nkomo-A on the gravel road from Giyani to Savulani, and is 20-km southeast of Giyani. On the northern side, it borders on the Klein Letaba River. Previously, people lived scattered throughout the area, but were formally allocated into Nkomo in 1968. Even when living scattered, the people were under the present Mahumani chieftancy.

Mahlathi

Mahlathi is approximately 38 km east of Giyani and borders on the Kruger National Park. The village was established in 1945, but prior to this date, villagers lived scattered throughout the area. The villagers were grouped together during the demarcation of residential sites in 1968, under Xibiti tribal authority in Giyani.

2.1.2 Northern District survey villages

The three villages surveyed were part of the "independent" Republic of Venda before 1994. The land tenure system is freehold and belongs to the people under the control of the traditional leaders.

Mapate

Mapate originated in 1921, with less than 100 households living scattered in the area. The chief was Tshilavhutume who came from Luaname (Mukumbani-Ha-Tshivhase) and included Mantondoni village under headman Sengani. The Village was demarcated in 1961 and the

[6] More detailed information about each village is in the Village Report, which can be obtained from NPDAE or ARC.

allocated stands occupied in 1964. A dirt road links these villages to the main road (R524) from Louis Trichardt to Thohoyandou. Mapate is 12 km to the west of the outskirts of Thohoyandou.

Vhurivhuri

Vhurivhuri is in the Lambwe River valley in the eastern Soutpansberg. The valley runs east-west and is approximately 2 km wide and 16 km long before opening up at both ends. Previously, people lived scattered in the valley, but in 1978 they were formally allocated plots in the Village. There are three villages in this narrow valley, with Vhurivhuri being the most eastern. Before 1927, the chief was Mr Mmbi. The present chief is Mr Sumbana.

Dididi

The village of Dididi existed as far back as the community can remember, some mentioned as far back as 1880. The Mmbubana family was one of the first families and is most represented in the village. Dididi is one of three villages under the chieftainship of chief Ramovha. Dididi is further subdivided into Maposa, Mungadi and Kondelela. Chief Ramovha in the past assigned authority of the village to one of his relatives.

2.1.3 Southern District survey villages

The two villages randomly selected for the survey formed part of the pre-1994 Lebowa homeland. Crops such as sorghum, maize, millet and beans were traditionally in the past stored in woven baskets e.g. *seshego*, but this practice has now been replaced with bags.

Bloublommetjieskloof

Bloublommetjieskloof (BB-kloof Service Centre) consists of three villages, Malogeng, Modimolle and Diamand (Mphayameng) along the Olifants River in the northwestern corner of the Sekhukhuneland sub-region. The chief of the area, Kgoshi Phasha has his tribal offices at GaNkwana on the southern side of the Leolo mountain range. As far as the villagers can remember, the area was populated before 1918, but villagers then lived scattered with no stands. Property stands were demarcated in the 1970's. Many are immigrants from other areas.

Ga-Phaahla

Ga-Phaahla is situated on the main tarred road (R579) from Lebowakgomo to Jane Furse, in the Nebo sub-region. It was mentioned that in the past all houses were of mud, but since the generation that worked the Rand mines in the 1950's returned, money and ideas have changed the architecture to western style brick houses.

2.2 Farmers' assets

One of the aims of the PRA survey was to analyse the livelihood strategies in the surveyed communities. However, to understand livelihood strategies it is important to investigate what is meant by a livelihood.

> *A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (Carney, 1998).*

Scoones (1996) also provides a summary of the problems faced by people in dryland areas and that impose upon their farming livelihoods:

> *'risk and uncertainty dominate people's lives in dryland areas. Whether it is variability at a field level imposed by patterns of rainfall, the impacts of crop pests or the heterogeneity of soil types, or variability at a more macro level due to changes in market conditions, shifts in wage levels or adjustments in economic policy, hazards of various sorts overshadow farming livelihoods'*

The capital assets which form part of the livelihood are described in Fig. 2.2.1 and Box 1.

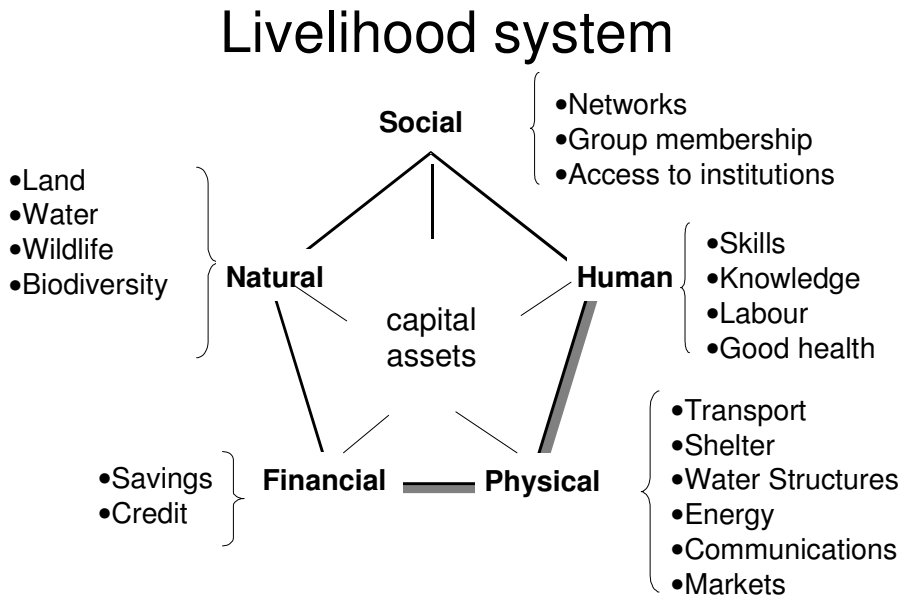


Figure 2.2.1 The livelihood system

Livelihoods are not static, and change over time as different shocks and trends influence them. This means that agricultural practices are in a continual change of flux as reflected in people's changing livelihood strategies. There are five different capital assets from which individuals draw

to build their livelihoods. They are natural capital, human capital, financial capital, physical capital and social capital (Box 2.2.1).

Capital assets

Natural capital
The natural resources that are available and useful to follow a livelihood (e.g. land, water, wildlife, biodiversity and environmental resources)

Social capital
The social resources (networks, membership of groups, relationships of trust, access to wider institutions of society) upon which people draw in pursuit of livelihoods.

Human capital
The skills, knowledge, ability to labour and good health important to the ability to pursue different livelihood strategies.

Physical capital
The basic infrastructure (transport, shelter, water, energy and communications) and the production equipment and means which enable people to pursue their livelihoods

Financial capital
The financial resources which are available to people (whether savings, supplies of credit or regular remittances or pensions and possibly livestock) and which provide them with different livelihood options

Adapted from Scoones, 1998 and cited in Carney, 1998.

Box 2.2.1 Description of capital assets within a livelihood context.

Trends and shocks influence the livelihood strategies of individuals. One such shock was the heavy rainfall at the end of the 1999/2000 summer season particularly in the Northern Province. This heavy rain caused flooding and large crop losses. This shock on the livelihood systems of the communities in the Northern Province influenced the approach followed by the survey team. The individual questionnaire had to be amended to reflect a "typical" season such as 1998/1999 to avoid responses being related only to an unusual disaster year. The floods caused many households to loose their crops, livestock, buildings and external contact. Vhurivhuri previously had two access roads to the village but after the floods only 4x4 vehicles can use the one road. Even though Mapate is near Thohoyandou, it was cut off from the outside world for a period of time, with both access bridges being damaged. The floods damaged the cultivated land along the banks of the river and the irrigation and purification systems were washed away. The farmers complained at Nkomo-B that they could not produce vegetables since all the irrigation pipes were washed away. Shocks such as these influence people's strategies to survive. In these cases, people could not go to work, nor sell their produce or they lost their entire crop, negatively affecting food security.

2.2.1 Natural capital

Livelihoods are derived from land, water, wildlife, biodiversity and environmental resources. All the surveyed villages have access to one or other sort of drinking water. In some cases like Basani, Mapate and Mathlati, they have reservoirs, or pump stations as at Bloublommetjieskloof. Nkomo-B was the only village where people mentioned they had problems with the supply of drinking water. In Nkomo-B, the women stated they have to walk to fetch water, which is labour intensive and time-consuming. In all the villages, people have access to agricultural land but their sites are small in the case of Mapate and Vhurivhuri. In the case of Vhurivhuri, people have to

plant on the very rocky terrain of mountain slopes. Land forms part of the land tenure system were the chief (with NPDAE) allocates land as fields to farmers and for communal grazing. Wood from cleared fields and from communal grazing areas are collected (and sold) for firewood, mostly for food processing. In the Southern District, with its limited number of trees (see Section 1.3.3 vegetation), electricity has replaced the use of a cooking fire. Availability of indigenous wood is also reflected in the number and type of granary built, such as the taller *nturuka* in the Mopani Veld, the predominantly wooden poled *dulu* of the Lowveld District and the smaller number and smaller-sized clay (mud)-covered *dulu* closer to urban areas (Mapate). The women of Mapate mentioned that wood collection for cooking fires (especially in vegetable processing for storage) was a constraint, as it became a longer task than in the past. Mapate farmers also mentioned that quality wood for granaries was becoming more scarce and expensive. Corrugated iron has replaced thatch grass in the Southern District, due to the availability of this form of roofing and the lack of grass. Wildlife in the form of baboons (Mapate), elephants (Mathlati) antelope, porcupine (Basani) and smaller mammals and birds were generally perceived as pests of agricultural crops. A tourism project has been initiated at Vhurivhuri, involving their Civic organisation and some village men.

2.2.2 Social capital

Social structures play a very important role in the Northern Province communities. One of the most important social organisations consists of the burial societies. There are also other different other societies in the communities like the *stokvel*, cooking clubs, sewing clubs and youth organisations. Mapate community has a 54-member mixed choir that wants to raise funds to make a recording. Most villages also have community gardens, usually started by women organisations with assistance of the CAD of NPDAE, but male (Ga-Phaahla) or mixed male and female (Mapate) groups are participating in the production of cash crops. Irrigated vegetables produced in these gardens are usually for home consumption for those participating, and the surplus is sold. Religion and Church groups play a strong role in communities, and in all of the villages surveyed, Churches of various denominations were visible (Plate 2.2.1). South African Breweries donated a Library to the Ga-Phaahla community in 1986, which is a source of information to the people in the village.

2.2.3 Human capital

There are primary and secondary schools in all the villages. A large percentage of the elderly are illiterate, while most of the youth have completed at least Grade 10. However unemployment is an issue and in most villages there is a large young population without job opportunities.

Farming skills are mainly passed down from generation to generation within households. Some farmers at Nkomo-B and at Bloublommetjieskloof mentioned that they have limited contact with extension officers. At the latter it was also mentioned that the Service Centre personnel had been reduced.

Indigenous knowledge is still prevalent in the use of aloe ash for the effective control of crop post-harvest pests (Southern District). However, the use of other indigenous plant materials, such as *ndzopfori* bark and *monze*, was known by only a few of the older villagers or those in more remote areas. The art of weaving grain storage baskets (e.g. *seshego*) has not only been replaced by the use of recycled maize meal bags, but other factors such as a decline of grass suitable for this practice have also played a role. Grain is also no longer stored underground.

Plate 2.2.1 Village map as drawn by the villagers of Nkomo-B in a community group exercise.

2.2.4 Physical capital

A very small percentage of the surveyed villages have clinics. The nearest hospitals are in the major towns in the regions, namely, Giyani, Thohoyandou and Jane Furse Memorial Hospital. Some clinics are open 24 hr per day and in cases like Vhurivhuri the ambulance could be called for an emergency from Thohoyandou. One of the greatest problems experienced by people who become ill was the high cost of transport in order to reach the hospitals or clinics. All the villagers have access to a shop, if only for the bare essentials. In most of the villages, groceries could be bought at spaza shops.

All villages have access to main roads. In some cases, the villages are situated near the major tarred roads while others have access via gravel roads. The late summer season rain and floods of 2000 (the worst in 40 years) had extensively damaged access routes, and in some cases, bridges were damaged or swept away, temporarily cutting off some villages. The public transport in the Province consists of private bus and taxi systems. Where villages are near the tarred roads, people have greater access to more public transport. The larger millers provide transport for their clients to and from the mill (see Appendix 7 "transport").

Electricity has largely replaced other forms of energy in villages closer to urban areas (Ga-Phaahla, Mapate). All the villagers had access to tap water, for most via communal taps in streets. However, in many cases there were complaints concerning the lack of water in certain streets or the lack of maintenance to reservoirs and their supply system after the floods. Radio's, television sets and cellular phones were visible in most villages. The more remote villages such as

Vhurivhuri due to its geographical isolation need satellite masts for television and cellular telephone reception.

In the Southern District, all houses had the same type of pit latrine. When inquiring about the supplier, they mentioned that it is made by a company in Pietersburg and sold by a local business to all households.

2.2.5 Financial capital

A large percentage of the people in the villages surveyed were over the age of sixty. Thus the pension pay-out from the Department of Health and Welfare (R560/month) is an important cash source for many households. In the villages surveyed, remittances from the nearby towns and cities provide a minor source of income but are often irregular and unreliable. Women mostly save money in the *stokvel* system. Those who are near towns save their money in the bank or Post Office savings accounts.

2.3 Survival strategies

The income sources mentioned by the surveyed communities can be grouped under the following seven headings: agriculture; pension; remittances; employment; trade and markets; self-employment; and other (Table 2.3.1).

Agriculture (crops and livestock) and pension are perceived by the communities as the most important overall survival strategies. Agriculture is the main survival strategy in all the communities, except for Bloublommetjieskloof (BB-kloof) where the income from employment (mines or from Government) and even from pension, played a bigger role. Livestock was mentioned as a survival strategy in all villages except Mapate and Ga-Phaahla., Farmers at Mapate and Ga-Phaahla villages mentioned that they did not have enough grazing land to keep livestock. Income from pension grants was rated as an important survival strategy in all villages, and especially so in Basani (by both men and women), in Ga-Phaahla and Mapate by the men, and in BB-kloof by the women.

The second most important source group of income used by the communities is trading and selling produce on the markets. Activities such as beer brewing, vegetable and poultry sales are included in this group. Many of these activities are linked to the next group, the "self-employed", which also involves creating products and providing a service, such as brick making and brick laying, producing and selling crafts, blacksmithing, and baking and selling food.

More detailed information about the survival strategies is given below.

2.3.1 Agriculture

Agriculture is a major survival strategy in all the surveyed villages, where the majority of the farmers are subsistence farmers, although certain surplus foods and cash crops may be sold. Maize was frequently mentioned as the most important staple crop.

Livestock is only sold when farmers do not have other livelihood strategies to fall back on. Cattle are of important cultural value. From the individual household questionnaires, it was found that cattle ownership is much higher in the Lowveld District were two-thirds of respondents stated owned cattle. In the Northern and Southern District, only one in five respondents owned cattle.

2.3.2 Pensions

The pension received by the elderly (men over 65 and women over 60) and the disabled form a very important income source in the communities. Pension pay-out (R560) occurs every month, and this occasion is also used by people as a social gathering and for trade. Produce is sold at the pension pay-out point and it becomes a market.

2.3.3 Remittances

The community members stated that remittances do not form a reliable source of income. Money was often not regularly remitted so could not be counted on, and was usually not a very large amount. It was listed as a minor source of income by Nkomo-B and Vhurivhuri (as well as Dididi), but only mentioned at Basani. People work in the nearby large towns like Thohoyandou and Giyani, but others also work in cities like Pietersburg, Pretoria and Johannesburg. Those who work far, often only return during the Easter and Christmas season, bringing food and money.

Table 2.3.1 Livelihood sources listed by all six villages surveyed in Northern Province.

	Lowveld District			Northern District				Southern District			
Income source	**Basani**	**Nkomo-B**		**Mapate**		**Vhurivhuri**		**BB-kloof**		**Ga-Phaala**	
	M & W	**M**	**W**	**M**	**W**	**M**	**W**	**M**	**W**	**M**	**W**
Agriculture										*30*	*25*
All crops		31	23	26	*	39	22	11	8		
Maize	31			0	18						
Vegetable				0	8						
Fruit				0	7						
Sugarcane				0	7						
Cattle/livestock	2	12	15			8	13	13	9		
Pension	*31*	*7*	*13*	*20*	*9*	*5*	*10*	*15*	*27*	*30*	*8*
Remittances		*9*	*10*			*3*	*0*				
Employed				*28*	*						
General workers	0			0	4						
Mining								15	15		
Government								15	15		
Seasonal labour								0	0	0	20
Compensation (mine)								3	2		
Trade & markets											
Beer brewing	7			0	8	14	12			0	10
Sale of poultry	5			0	7			3	3	0	0
Sale of vegetable/fruit	8	7	3			8	18			10	0
Sale of mats/clothes	4	0	0								
Bake/sale vetkoek	1			0	3						
Fry/sale fish	1										
Collect/sale firewood	1	4	9	0	5	2	3	3	2		
"Spaza" shops	6							2	8		
Sale of sand								5	2		
Sale of cosmetics								0	2		
Self employment				*19*	*						
Brick making	1	4	0	0	6	4	7	0	1	10	20
Brick laying/building		7	10			1	9			20	7
Thatching		5	0			8	0				
Mechanic/welding		6	0	0	6						
Fencing		8	0							0	0
Woodcraft				0	5	1	0				
Needle craft	2	0	17	0	3			3	1	0	10
Pottery						0	6				
Transport/drivers								6	1		
Other											
Traditional healers				*7*	*4*	*3*	*0*	*6*	*3*		
Maintenance (divorce)								0	1		
Tourism						4	0				

*The women of Mapate did not group the activities like the men did, but scored each single item as shown

The grey areas indicate that the income source was not mentioned by the farmers

2.3.4 Employment

The women in Ga-Phaahla mentioned that seasonal labour (weeding and harvesting) was a highly significant source of income. They use the income from seasonal labour and brick-making to buy fruit and vegetables, which they sell at a profit (see 2.3.5). Many of the men at Bloublommetjieskloof earn an income from working in the local mines. A small number also receive compensation from the asbestos mine. Some households have members employed as teachers, nurses and other civil servants. The men from Mapate listed "general workers (*vhashumi*)" as an important source of income, this term refers to those employed as civil servants, workers in town and seasonal labourers at the nearby tea estate.

2.3.5 Income from trade and markets

Spaza shops and other businesses were found in all the villages surveyed. Spaza shops are usually run by families from within the community. The spaza shops in Vhurivhuri are all constructed from corrugated iron. One of the spaza shop owners mentioned that the shop was manufactured and fitted by a company in Pietersburg. A source of income in all the villages is the selling of fruit and vegetables. It is mostly the responsibility of the women to sell fruit and vegetables at informal markets (Plate 2.3.1), from door to door, at schools or near bus stops and taxi ranks. These products are usually bought in bulk (from either the larger markets or directly from commercial farmers) and packed in smaller units for sale. Broilers are also bought and sold. Women also sell sweets, cold-drinks, old and new clothes as well as needle craft items. Villagers residing near larger towns also sell their produce at the town informal market or on the town streets. Women also prepare food at home or on site to be sold, as fried fish and “vetkoek”. Firewood is collected and sold in all the villages, but was not listed in Ga-Phaahla village, which has electricity. In all the villages, beer brewing was one of the most important sources of income. In Vhurivhuri, it was stated that the income from the sale of home-brewed beer paid for their children’s school and university fees. The women are responsible for brewing and selling of beer. Beer is mostly brewed from sorghum and millet, but also from the marula fruit (*Sclerocarya birrea*) in summer.

Plate 2.3.1 Informal vegetable and fruit market

2.3.6 Self-employment

Brick-making (Plate 2.3.2) usually done by women, was listed as a source of income in all the villages surveyed. In Ga-Phaahla, brick-making received a very high score, with the women mainly involved while the men were the brick layers. Brick-making was mentioned to be very labour intensive by the Ga-Phaahla community, but the women stated that they needed the income in order to buy other produce such as fruit and vegetables and clothes which they would sell in turn.

Plate 2.3.2 Brick-making in Basani.

Some villagers run small businesses like welding, vehicle repair, fence-making and fencing. Others specialise in roof thatching, building (e.g. granaries), or doing general building repairs during the winter. The women (sometimes with the help of the men) are responsible for collecting thatch grass while the men are responsible for thatching. (When the Mahlathi community was asked who was responsible for roof thatching, the women replied they were. In response, the men then commented that in that case they would stop assisting them with thatching).

Handicrafts are also a source of income. Women from Nkomo-B and Ga-Phaahla rated needlecraft (including dressmaking and crocheting) as important income sources. These items are sold in the nearest big town or locally to those who are not involved with handicrafts. Some men are involved in woodcrafts, producing walking sticks and handles for farming implements (hand hoes and axes). These crafts are also sold locally and in the nearby towns.

2.3.7 Other sources of income

Traditional healers were mentioned in the Northern District and at Bloublommetjieskloof as they receive income from customers. The communities mentioned that this was a specialised job and therefore only brought income into a few households. A tourism project initiated at Vhurivhuri could bring income to some households in that village.

2.4 The farming system

2.4.1 Crops grown

Table 2.4.1 Crops grown by the six villages in the three Districts surveyed in Northern Province

Crop	Lowveld District			Northern District				Southern District			
	Basani		Nkomo-B	Mapate		Vhurivhuri		BB-kloof		Ga-Phaala	
Men/Women	M	W	M & W	M	W	M	W	M	W	M	W
Grain											
Maize	40	27	23	25	19	21	26	36	36	20	10
Sorghum	2	1				3*	15*	32	32	28	20
Sweet-sorghum	1	2	2					6	6	0	1
Millet						3*	15*			28	20
Legumes											
Beans								11	11	5	10
Cowpeas	6	15	6			6	8			10	10
Njugo beans	6	10	9			12	6			2	10
China peas										5	10
Oilseeds											
Groundnuts	30	19	10	6	11	6	5			0	5
Roots & tubers											
Sweet potatoes			2	2	2	6	0				
Potatoes											
Vegetables								*5*	*5*		
Pumpkin	3	3	6	14	19	5	3	4	4	0	2
Wild melon A	2	3	2			3	4				
Wild melon B	5	1									
Watermelon	2	5	7					4	4	2	3
Melon	2	4									
Butternuts			4								
Cabbage			6	11	9						
Spinach			7	8	5						
China spinach				5	22	10	9				
Black nightshade				1	3						
Tomatoes			6	13	6	10	6				
Onions				11	4						
Okra	1	10	6								
Chilies				4	-						
Fruit						*4*	*8*	*2*	*2*		
Mangoes			2								
Pawpaws			1								
Other											
Sugarcane						4	9				
Tobacco						4	0				

Wild melon A = maranca (marhanga) Wild melon B = xichumbe

* includes sorghum and millet

0 indicates gender group scored 0 for this crop

- indicates gender group did not score this crop as it was not listed as such

In a simple scoring exercise, each village was asked to list their most important crops (Plate 2.4.1). Each gender group was asked to rank the importance of the listed crops in a scoring exercise with 100 stones (Table 2.4.1). The group was further asked to indicate which gender was responsible for the crop producing and harvesting activities of each crop, and to indicate the uses of the crop. As only the major crops were listed, other minor crops may also be grown. The different crops were also recorded in the household questionnaire (Table 2.4.2).

Table 2.4.2 Number of interviewed respondents from the three Districts surveyed who grow the different major crops.

Village	Maize	Sorghum	Other grains	Legumes	Oilseeds	Roots and tubers	Vegetables	Fruits
Basani	30	2	1	28	28	0	18	0
Nkomo B	30	3	4	27	27	0	23	1
Mapate	30	0	1	5	9	0	17	0
Vhurivhuri	30	3	3	20	16	1	20	1
BB-kloof	19	25	1	13	1	0	16	0
Ga-Phaahla	10	23	16	24	5	1	14	2
Total	149	56	26	117	86	2	108	4

A list detailing the names of crops and other plants grown in the Northern Province in local and scientific languages is given in Appendix 8.

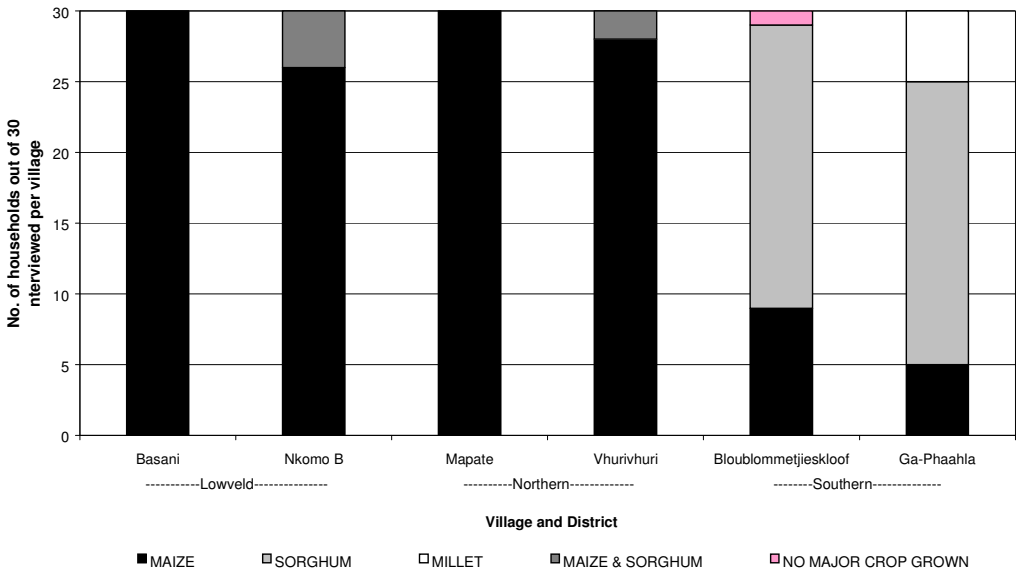


Figure 2.4.1 Comparison of the major staple crop(s) grown in six villages in the Northern Province.

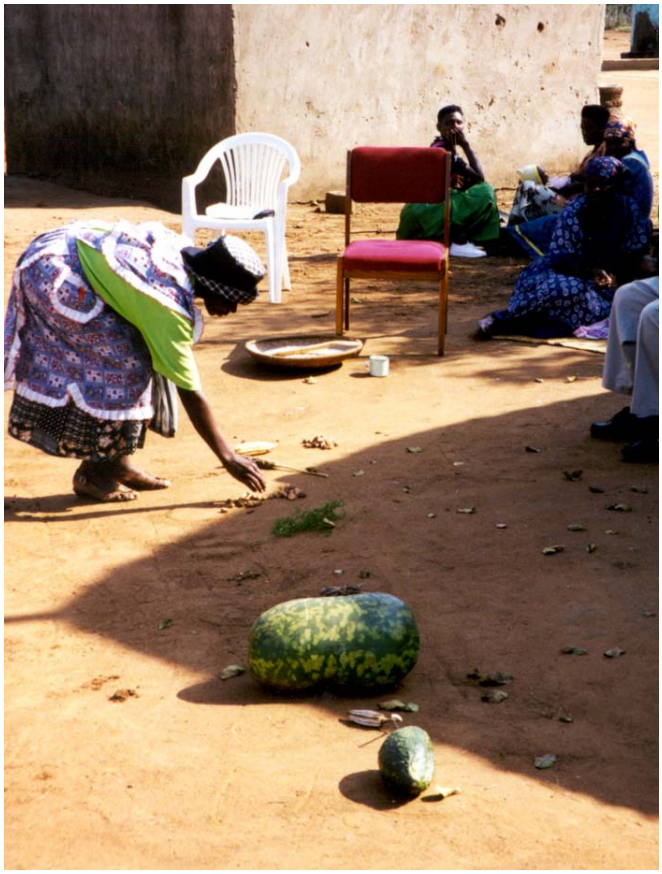


Plate 2.4.1 Ranking and scoring the major crops at Mahlathi.

Grain

From the household questionnaire, 158 respondents from the 180 interviewed (87.8%) stated that they had stored their staple crop in the 1998/99 season. More than 80% of the staple crop produced is for food, while the remainder is mainly for seed and less than 10% is for sale.

The major staple crop, except in the Southern District, is dry-land maize. Maize is of such importance that the communities of Basani and Mapate also specifically listed it as a survival strategy (see Section 2.3). In the Southern District, along the Olifants River, sorghum and maize are the major crops (BB-kloof), but in communities further away from the river (Ga-Phaahla), sorghum is the dominant crop, followed by millet and maize (Fig. 2.4.1).

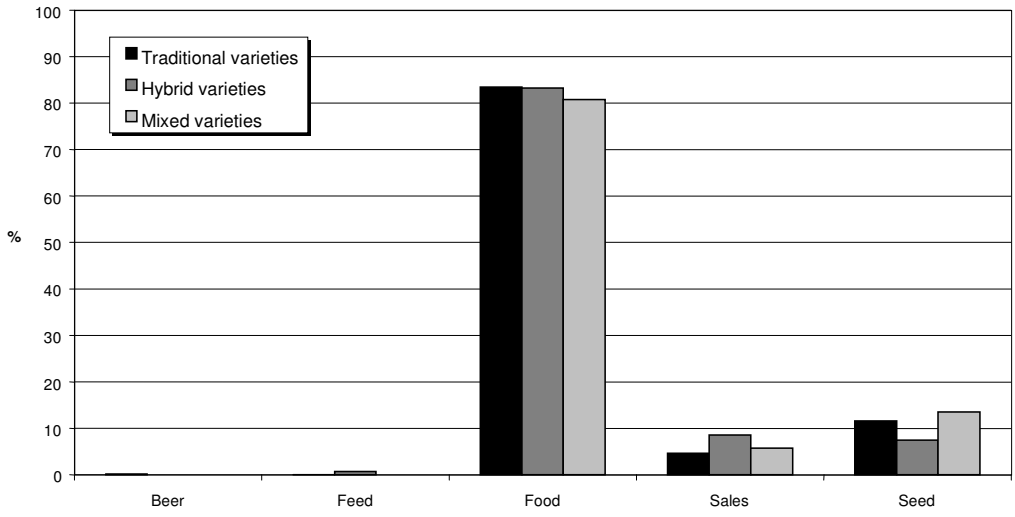
Maize forms the staple diet and is predominantly produced for home consumption. In most cases, only the surplus is sold, if ever, or in cases of emergency where cash is needed. Other crops produced will be sold or bartered in exchange for maize. The importance of maize as the food crop was further reflected in the Agricultural Calendar exercise, as food availability was seen as "scarce" when the maize (the main staple) was low. Farmers felt that even if there were enough vegetables to eat at the end of the season, a meal was incomplete without maize (porridge).

In most cases, it was stated that both women and men were involved in the maize production and harvest, and even storage, whereas the men in general did not assist much (except for certain cash crops) in the production and especially the harvest of the other crops.

The building of a granary specifically for the storage of maize further reflects the importance of maize. Other crops are mostly stored processed in bags (legumes, oil seeds, and vegetables) in the house, or underneath a granary (e.g. pumpkins) such as the *dulu*. The *dulu* is a wood or a wood-and-mud granary raised less than 1 m from the ground and is found in both the Northern and Lowveld Districts. In the eastern Lowveld District (Mahlathi), a second type of granary, or the *nturuka* is used. It is raised 1.5 m or more above the ground, and is built over the kitchen. The floor of the *nturuka* forms the roof of the kitchen, and the smoke from the hearth serves as pest repellent as it permeates the maize stored above.

Maize is also produced in the form of green maize or green mealies, and eaten and sold as such. At Ga-Phaahla, maize was only produced as green mealies.

Sorghum and millet, the major crops occurring in the Southern District areas further away from the Olifants river, such as Ga-Phaahla, have multiple uses. They are produced as the staple diet (porridge), but also for malt in the brewing of beer. This beer is primarily produced for sale. Beer brewing was listed as an income source in all three surveyed Districts. Sweet sorghum, a sorghum variety selected for its high sugar content the stem of which is eaten like sugar cane, is also produced in the Lowveld and Southern Districts and is sold as "sweet-cane".



Note: Out of 180 farmers interviewed, 150 grew traditional varieties, 28 grew hybrid varieties (2 grew hybrid maize just for sale), 14 grew mixed varieties

Figure 2.4.2 Overview of staple crop utilisation in the Northern Province

In all three surveyed Districts, the production of traditional maize (open pollinated varieties) was higher than that of hybrid maize varieties. Out of the 180 households interviewed, 150 grew traditional varieties, 28 grew hybrid varieties and 14 grew mixed traditional and hybrid varieties. Traditional maize seed is self-produced while hybrid seed has to be bought. Traditional maize was also stated to be more resistant to post-harvest pest damage than the hybrid maize varieties.

The tendency to plant hybrid maize is done by those farmers who are able deliver maize to the NTK mill (Thohoyandou, Northern District). Most farmers were keen to plant hybrid maize because of its shorter growth period, larger yield and better marketability (as green maize and to NTK). Lack of hybrid seed was listed as an agricultural constraint by four of the communities surveyed. In Mapate, it was listed as a major constraint. Most of these farmers, however, stated that they would still plant traditional maize, together with hybrids, as they claimed that hybrid varieties are more susceptible to storage insect damage.

Legumes

Legumes were grown by 117 of the 180 households interviewed (Table 2.4.2). Beans, in the form of dry-beans, cowpeas and njugo beans (bambara groundnuts), are produced in all three Districts surveyed as a crop with multiple uses. Not only are the pods harvested, shelled and stored in bags, but the leaves are also picked as a vegetable and cooked and either eaten fresh or dried and stored. Green gram or "china pea" is also produced in the Southern District. Njugo beans are traditionally planted only in January.

The responsibility of growing legumes falls mainly to the women, although men can be involved, and in some cases men also assisted during harvest and shelling. Women are, however, responsible for storage.

Oilseeds

Groundnuts are grown in all three Districts, but their importance varies. Of the 180 households interviewed, 86 grew groundnuts (Table 2.4.2). In the Lowveld District, it was grown by 92% of the respondents, while only by 10% in the Southern District. At Basani, the crop was ranked as the major crop after maize (Table 2.4.1). In the Southern District, it is a minor crop, listed and ranked by the women at Ga-Phaahla, but not listed at all at Bloublommetjieskloof, where only a few people produced it. In the surveyed areas where it is grown, it is shelled and stored in bags in the house, with the storage period usually being determined by the yield. It is produced mostly for home consumption, but also for sale locally after time to those who do not have.

Root and tuber crops

Although sweet-potatoes are grown in the sub-tropical Northern and Lowveld Districts, they were not ranked as an important crop. In areas where it is grown, the sweet potato is often used as a barter item, especially in exchange for maize at the end of the season. The responsibility of sweet potato production and harvest is that of the women. Only two respondents from the 180 interviewed, produced sweet potatoes (Table 2.4.2).

Potatoes are regarded as a vegetable which is only grown by those with irrigated vegetable gardens. None of the villages listed potatoes as one of their major crops.

Vegetables

Out of the 180 households interviewed, 108 grew vegetables in all three Districts (Table 2.4.2). Vegetables can be divided into two groups;

- The leaves of legumes and cucurbits produced under dry-land conditions; and
- Vegetables grown under irrigation.

Leaves from legumes (cowpeas) and cucurbits (pumpkins) are picked as a vegetable and stored. These are mostly for home consumption, but is also sold locally. The fruit of the cucurbits

(pumpkins, watermelon and melon) are either harvested for use fresh, or stored for later use. Pumpkin fruit is in general not sold. Pumpkin seeds and flowers are also harvested and stored. These crops are grown with the grain crops.

The other vegetables, such as the brassicas (cabbage and china spinach), tomatoes and spinach (Swiss chard) are grown in vegetable gardens or in community gardens in areas were irrigation water is available. China spinach was listed by the women of Mapate as their most important crop. Vegetables are often viewed as cash crops, and some such as chillies grown by men at Mapate are solely a cash crop.

Women are responsible for the production, harvesting and storage of all the vegetables, with the exception of those being grown as cash crops.

Fruit and sugarcane

Fruit trees grow in the yards of most households in the three Districts surveyed. Their produce is for home-use only as the yield is very limited. The fruit is eaten fresh when ripe, with mangoes, bananas and paw-paws being the more popular home-yard trees. The exception is in the Northern District villages surveyed, were some farmers had orchards, producing mangoes, avocados, bananas, paw-paws and macadamia nuts[7]. These fruits are sold at local markets and in the cities. Mangoes at Mapate are produced for the achaar (chutney) factory. Sugarcane is also grown in the yard and used as a cash crop.

Field-collected food sources

In summer, the young leaves and roots of a number of wild plants are collected as vegetables (miroho). The leaves of *Corchorus tridens* (Tiliacea), cockscomb (*Amaranthus spp*), wild melon, (*Momordica foetida*) and blackjack (*Bidens pilosa*) are picked when young, cooked and eaten, or dried and stored (Plate 2.4.2). Some wild plants are also used for their medicinal value.

Plate 2.4.2 Sun drying blackjack (*Bidens pilosa*) (Northern District).

[7] The Mapate villagers did not list fruit during the community group exercise "crops grown", as they saw it as long-term produce and initially only listed annual crops. After discussion, sugarcane and fruit were ranked as 2nd and 3rd most important crops, respectively, after maize. Both fruit and sugarcane are mainly cash crops.

Mostly, villagers tending cattle or collecting firewood pick wild fruit. The fruit of the marula (*Sclerocarya birrea*) is collected and used to brew a drink, which is also sold.

Other field-collected food sources mentioned were the "mopane worm" or emperor moth caterpillar (*Gonimbrasia belina*) in the Mopani Veld of the Lowveld District, termites and locusts (Vhurivhuri). Mopane worms are dried and sold at markets and are considered to be a highly nutritious delicacy.

2.4.2 Agricultural calendar

(See Fig. 2.4.3: Agricultural calendar for Ga-Phaahla)

The Northern Province, as is the larger part of South Africa, is situated in a summer rainfall area. All the communities indicated by scoring the rainfall period to be from October/ November to March, with peak rain occurring in November and February. Dry-land farming activities are naturally closely related to the rainfall pattern. The fields are cleared and ploughed at the start of the summer rainfall, and planted from October to December. All the crops except for njugo beans are planted in this period. Most farmers sow their dry-land crops (such as the staple grain, legumes and pumpkins) mixed and broadcast in the same fields. However, the different grains are sown separately from each other. Njugo beans are planted traditionally only in January. Vegetable cash crop planting can be regulated by irrigation, which in turn depends on water available for irrigation in the rivers and streams. Both women and men are responsible for planting; the men being more involved in the soil preparation. In all three Districts, the lack of tractors and/or implements was listed as a major constraint. All villagers stated that with the few tractors available, planting was often delayed. At Mapate, where the fields are smaller, soil preparation is done by hand-hoes.

The fields are weeded from January, and it is the task of the women. In the Northern District, weeding is done as a once-off activity, while in the other Districts it is a continuous process. Seasonal labourers are sometimes "hired" and some women in the survey listed this as an important survival strategy (see Section 2.3).

The early harvesting involves the picking of vegetables, mainly pumpkin leaves, in January, for home consumption. Further leaf pickings of pumpkin and cowpeas and the harvesting of green maize, where it is planted as such, as well as cucurbit fruit follow this in March and April. The villagers of Bloublommetjieskloof also pick a portion of their bean crop as green beans. The main harvest period is from May onwards, when maize and/or sorghum, legumes and groundnuts are harvested. Depending on time of planting, harvesting can last well into July.

Processing of produce for storage follows harvesting. Maize is either shelled and bagged, or stored on the cob in granaries. Sorghum and millet is threshed on threshing-floors, winnowed by hand and placed in bags for storage. The legumes and groundnuts are shelled and bagged and vegetable leaves cooked, dried, usually on sheets of corrugated iron (Plate 2.4.3), and stored in bags.

The cucurbit fruit are picked, with the stalk, and placed in storage, either underneath the granary or in the house. Bagged produce is usually stored in the house, most often in the bedroom, or in a separate building by the few whom own such a storeroom.

	October	November	December	January	February	March	April	May	June	July	August	September
Rainfall	5	10	10	7	6	9	6	4	1	0	0	0
Labour	3	3	3	10	10	8	8	8	10	10	8	0
Key activities	Soil preparation											
		Planting	Planting									
				Weeding	Weeding	Weeding						
Harvest						Beans	Pumpkin leaves					
Harvest							Green maize					
Harvest							Cowpeas					
Harvest							Njugo beans & green gram					
Harvest							Water melon & maranca					
Harvest									Sorghum			
Processing										Threshing & transport (from field to home)		
Consumption	6	5	1	1	0	10	10	10	10	10	10	8
Buy in	0	0	4	4	5	0	0	0	0	0	0	0
Coping strategies			The strategies mentioned in livelihood sources (Section 2.3)									
	Two meals per day					Three meals per day						

Figure 2.4.3 Agricultural calendar for Ga-Phaahla.

Plate 2.4.3 Sun drying of vegetables (pumpkin flowers) on sheets of corrugated iron.

The 80-kg commercial maize meal bag has become the standard storage container for legumes, groundnuts and even the grain crops for those who do not own a granary. It has replaced the woven basket grain-storage container (e.g. *seshego*) in the Southern District. It is also often used as standard unit to determine yield. A "lack of bags" was also mentioned as a constraint in some villages.

Some villages indicated the combined activities in a month as labour-intensive, while others indicated the activities linked to a crop as laborious. The months where ploughing, planting and weeding occurred were rated as being the most laborious. These are the summer months of November to February. Weeding as an activity was generally rated as being the most labour-intensive. The main harvest in May was a further peak in high labour activity, followed by the processing of the harvest, involving the shelling of crops or the threshing of sorghum in the Southern Region. The villagers of Nkomo-B and Vhurivhuri, to some extent, indicated all the months of the year as laborious. Other than the planting to harvest agricultural activities, Nkomo-B villagers also stipulated clearing of fields prior to ploughing as well as collecting thatch grass in winter as laborious. The fact that this village has a household water shortage, which has to be collected, also influences their normal activities. In general villagers, with exceptions, indicated that they are not so active in the late winter months. Although a continuous activity, firewood collection is the main task during winter.

2.4.3 Food security calendar

Food consumption

Food availability and food consumption is the highest during the harvesting period of March to June. In most villages, home-grown food lasts until October, after which food has to be bought in, usually in the form of maize meal, until the next harvesting occurs from March to April. Nkomo-B farmers indicated a food shortage period from August to the beginning of February, while in Ga-Phaahla home-grown food may last until November (Fig. 2.4.3). Maize (or sorghum in the

Southern District) was the standard used by all the communities to determine availability or shortage of food. In most cases, stored legumes, groundnuts and/or dried vegetables lasted until the next harvest. Low food security is most serious from the end of the year until the next harvest in autumn. An example of this is found in the statement made in Ga-Phaahla: "From March to September, farmers and their families have three meals a day, but from October to February, only two meals a day". Ironically, the months ranked as the most laborious in agricultural activities, is also when most villagers are experiencing a food shortage.

The different communities visited discussed the reasons why production of home-grown food was not enough to feed them for a year. Key points are as follows:

- Nkomo-B and Bloublommetjieskloof farmers' felt the major constraint was the lack of water. With water stability, they would be able to produce cash crops, and thus earn money for food in the lean period, and so reduce their vulnerability during this time; and
- Basani and Mapate farmers felt they would be able to produce more only if they had more or larger fields. The allocated plots at Basani were considered too small, while at Mapate, rapid human population growth was restricting the area farmers could use as production fields. Vhurivhuri farmers were restricted to arable fields in the valley.

Post-harvest pest damage (rodents and insects) to stored produce (especially grain and legumes) also reduced the quantity and quality of food. Farmers could not calculate how much was lost this way. Some farmers mentioned they reduce the risk by consuming their stored crops faster than the weevils can eat them.

Coping strategies

The farmers mentioned various coping strategies during this food-scarce period. Food is mostly bought in the form of maize meal (from traders) or surplus non-grain crops are exchanged (barter) for maize from neighbours or other villagers. Money was earned through activities listed in the income sources exercise, such as pension or money received from salaried family members, sale of items (e.g. clothes) or cash crops, income from crafts (brick-making, brewed beer, needle craft) and seasonal labour. In Vhurivhuri, they mentioned that they were always short of money but never short of food.

2.4.4 Agricultural constraints

The communities were asked to list their agricultural constraints (Table 2.4.3) and no emphasis was made by the facilitators to ensure that these included post-harvest constraints, as it was felt important to learn how post-harvest constraints were viewed in relation to other agricultural constraints. The agricultural constraints mentioned by the communities can be combined into four groups: Physical, natural, human and financial. These can be further grouped into pre-harvest and post-harvest constraints.

Physical constraints

Lack of tractors and implements (e.g. ploughs and hoes) was ranked as the greatest constraint by both genders in all six villages. In Nkomo B, however, lack of water and irrigation exceeded this constraint in importance. At Bloublommetjieskloof, the men considered the lack of fences the highest constraint. In Ga-Paahla, the tractor constraint was overtaken by lack of threshing machine (a harvesting constraint). Out of the 180 households interviewed, 114 stated hiring a tractor to cultivate their fields, 38 hired animal draft power and 65 cultivated land by hand hoes

Table 2.4.3 Agricultural constraints listed by the six villages surveyed in Northern Province

Constraint	Lowveld District				Northern District				Southern District			
	Basani		Nkomo-B		Mapate		Vhurivhuri		BB-kloof		Ga-Phaahla	
Men & Women	M	W	M	W	M	W	M	W	M	W	M	W
Physical												
Lack of tractor & implements	34	21	13	20	18	17	16	31	11	8	10	9
Lack of fences	15	21	10	10			11	6	19	5	8	5
Lack of thresher											14	7
Lack of mills									-	10		
Lack of co-op									-	8		
Transport: field - home	6	8			6	5			7	6	8	4
Transport: home to market/mill					4	6			8			
Distance to mill	5	11										
Distance to market							9	0				
Lack of market			4	0					7	7	0	7
Lack of grazing							6	0				
Lack of dip tank			4	6								
Lack of irrigation			11	0								
Lack of storage											0	7
Susceptible hybrid seed	3	2										
Natural												
Insect pests & diseases			7	8	10	12	4	4	4	13	11	5
Insect pests in storage	3	7					6	19	2	5	3	6
Termites							7	11			11	7
Diseases									5	-		
Damage by birds									5	-	11	9
Rodents	6	5	6	11							2	5
Witch weed							4	10	5	-	13	8
Drought							7	7				
Wild animal damage									-	6		
Soil erosion							5	6				
Infertile soil											3	9
Lack of water/irrigation			30	38	7	3			-	11		
Water logging											4	4
Human												
Lack of information			14	7					9	7		
Lack of info processing									-	3		
Labour to fence	2	4										
Labour shortage	3	2			7	7						
Labour to clear fields	17	9										
Weeding laborious					8	8						
Theft	1	4									4	5
Harvesting laborious					7	5			8	-		
Shelling laborious					5	8						
Poor agric. practices											2	5
Financial												
Transport cost	5	6										
Lack of pesticides					8	-			-	4		
Lack of seed			7	10	9	14	9	8	7	3		
Lack of fertiliser			4	0	11	15	9	10	-	4		

0 indicates it was scored 0 - indicates it was not scored as it was not listed

(59 using family labour and six respondents hired labour). Only four of the respondents owned a tractor and eight used their own animal draft power (Table 2.4.4).

Table 2.4.4 Land cultivation practices in the six villages surveyed.

Village	Handhoe/ family labour	Animal draft power/ own	Tractor/ own	Hand hoe/ hired labour	Animal draft power/ hired	Tractor/hired
Basani	4	5	0	2	8	16
Nkomo-B	5	1	2	3	6	25
Mapate	17	0	1	0	0	16
Vhurivhuri	20	0	0	1	8	8
BB-kloof	5	2	0	0	12	22
Ga-Phaahla	8	0	1	0	4	27
Total	59	8	4	6	38	114

Lack of fences was generally considered the next most major constraint. This involved the cost and labour to fence off fields from damage by domestic and wild animals. In Mahlathi village, the community had removed the fencing, which had been placed around their grazing field in order to use it at their homesteads. As a result, livestock now regularly damaged field crops.

Lack of mills was considered as a constraint only by the woman of Bloublommetjiesloof, whilst all the other villages had access to mills, with several of them having millers in their community. Mills were not considered a constraint in Vhurivhuri, although the time spent at the mills, and the distance to the mills was considered a constraint, especially so by Basani villagers.

Transport (field to house) was the third most important post harvest constraint ranked by maize and sorghum farmers. It was considered a major constraint in Mapate, Basani and the Southern District villages, as it was done on the head and considered hard work. Of the 180 interviewed, 83 stated carrying the harvest by head-load, while 117 used a vehicle (cart, tractor or bakkie) of which only 12 owned the vehicle. Family labour was the most common method of harvest transport, followed by the use of hired animal-drawn carts (Table 2.4.5).

Table 2.4.5 Transport of the major staple crop from the field to the homestead.

Village	By headload/ family labour	Animal cart/ own	Bakkie/ own	Tractor-trailor/own	By headload/ hired labour	Animal-cart/ hired	Bakkie/ hired	Tractor-trailor/ hired
Basani	7	2	0	0	1	18	1	4
Nkomo-B	7	0	1	2	0	7	12	4
Mapate	22	0	3	0	2	0	8	0
Vhurivhuri	29	0	1	0	0	0	0	0
BB-kloof	9	2	0	0	3	21	1	3
Ga-Phaahla	3	0	0	1	0	9	0	17
Total	77	4	5	3	6	55	22	28

Transport (house to mill/market) was a constraint at Mapate and Bloublommetjieskloof. The transport problem at Mapate was to transport fruit (especially mangoes) to the market or achaar (chutney) factory.

Distance to market was identified as a constraint by those living in Vhurivhuri and Mahlathi, which is to be expected, since they live quite far away from the larger markets.

Lack of market was also considered a constraint, implying the lack of a formal market.

Lack of storage was only listed by the women of Ga-Phaahla. This refers to a lack of bags in which to store produce, but this constraint was also mentioned by the women of Bloublommetjieskloof and Mapate. Mapate women blamed the lack of storage facilities on the cost and labour required to build granaries as well as the limited building materials. Out of the 180 households interviewed, 158 stored their main staple crops. Of these, 57 stored their staple crop in a granary and 96 in the house or kitchen.

Natural constraints

Pre- and post-harvest **insect pests and diseases** undoubtedly were the major constraint in all the villages. Generally, weevils, moths, baboons, rodents, termites, stalkborers, aphids and diseases were considered to be as destructive to maize in the field as the rodents and weevils (and other insects) were to grain in storage. "Insect pests in storage" was the most important post-harvest constraint ranked by maize (Fig 2.4.4) and sorghum (Fig. 2.4.5) staple crop farmers in the individual questionnaire. Amongst the communities surveyed, a preference exists for traditional (open pollinated variety) maize, as it is hard and thus not easily attacked in storage. Hybrid seed is more susceptible to insect and rodent damage in storage, and was mentioned as a constraint. The communities mentioned that weevil infestation builds up in the field when maize is left for the long period to dry, and is then allowed to continue during storage. Cobs are also often hung in trees. Ash is also used in some villages, with aloe ash being mixed with grains at home (Southern District). It was mentioned that there were fewer problems with pests after maize had been milled and stored in bags (Basani).

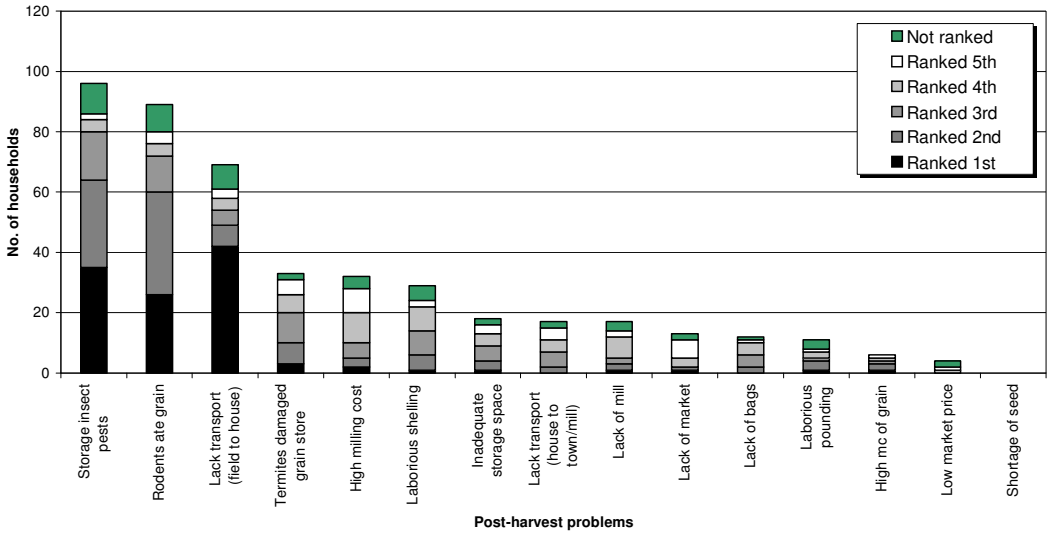


Figure 2.4.4 Ranked post-harvest maize problems experienced by 128 farmers growing maize as their staple crop in the Northern Province.

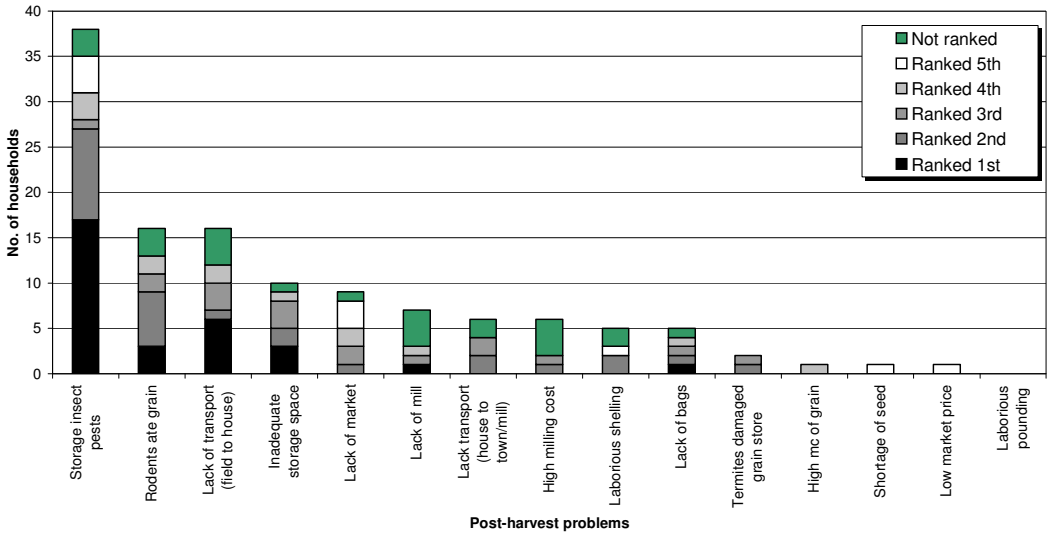


Figure 2.4.5 Ranked post-harvest sorghum problems experienced by 40 farmers growing sorghum as their major staple crop in the Northern Province.

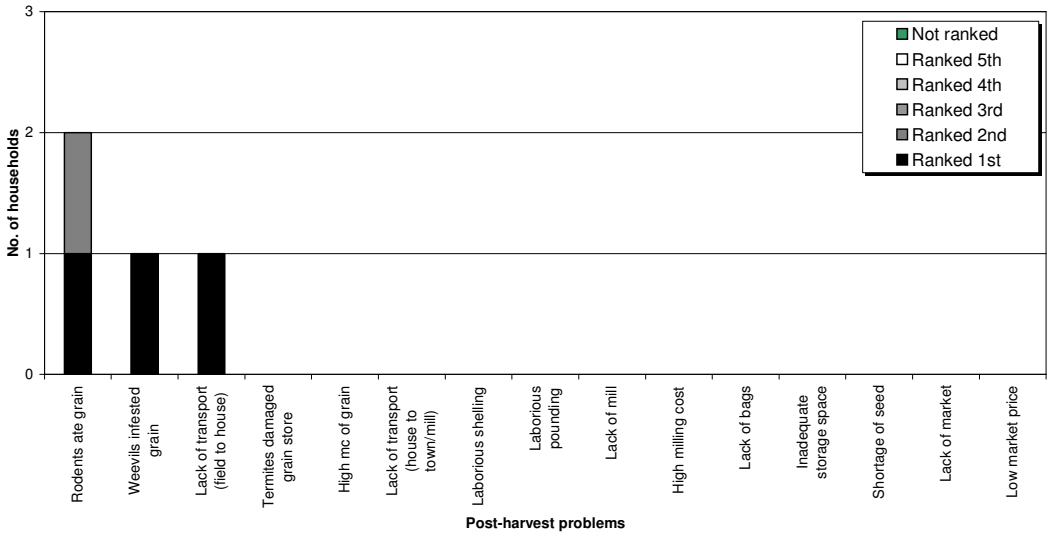


Figure 2.4.6 Ranked post-harvest pearl millet problems experienced by five farmers growing pearl millet as their staple crop in the Northern Province.

The Bloublommetjieskloof farmers felt stored maize was more susceptible to insect pest problems than stored sorghum, while millet was reported to be able to be stored insect-free for a year by Ga-Phaahla farmers (Fig. 2.4.6).

Threshed sorghum in the Southern District is often mixed with aloe ash and then stored in bags in house. Aloe ash was only found to be effective for a three-month duration, after which time

weevils became a problem. In Ga-Phaahla, storage insects already infested its main staple crop, sorghum, while still in the field. After threshing, the grain was treated with aloe ash, but losses of 50% were frequently experienced during the storage period. Aloe ash is usually admixed with the grain at a rate of 20-l ash to twenty 80-kg bags of grain.

In general, maize seed is protected by storing it in a container, such as a bucket, tin or plastic bag, hung on the cob in the kitchen smoke, soaked in paraffin or mixed with cattle dung or aloe ash (Southern District).

Njugo beans and cowpeas were damaged by insects during storage in bags inside houses (Basani).
In Mapate, weevils were reported to attack stored beans but this was not considered too serious due to the initial yield being so small.

In Bloublommetjieskloof, legume seeds were mixed in aloe ash but this form of protection only lasts 3 months. In Ga-Paahla, insects easily attack dry beans and green grass, even while still in field. According to Vhurivhuri farmers, weevils do not attack njugo beans, as they are too hard in texture. "Storage insect pests" was the highest ranked post-harvest legume and vegetable problem.

In storage, **rodent** control was the second largest issue after insect pests by maize and sorghum farmers. It was a problem at Mahlathi (Plate 2.4.4) and at Nkomo-B it was ranked the most important post-harvest constraint and during the survey feedback in January 2001, Nkomo-B farmers indicated that the rodent problem was escalating because of the drought.

Plate 2.4.4 Rodent catches at Mahlathi (Lowveld District)

It was claimed that the rodenticide available (Rattex®, difethialone) showed little efficacy. Traps were used, but most farmers do not apply any form of control. Some farmers mentioned they keep cats. Rodents also attack groundnuts in the field (Nkomo-B) and was also the highest ranked post-harvest groundnut issue.

Wild animals as pre-harvest pests were listed at Bloublommetjieskloof. At Mahlathi, elephants were specifically mentioned. Some individuals in other villages also mentioned antelopes, and

moles were mentioned as a problem in the groundnut fields at Ga-Phaahla. Birds (seed-feeders) are a common problem in the sorghum and millet fields in the Southern District. To overcome this problem, all farmers plant simultaneously to minimise risk to their own fields.

Witch weed (*Striga asiatica*), a maize associated parasite, is a general problem in areas where maize is planted late and this was reported to being associated with late rains or late ploughing.

The lack of **water** and/or irrigation system is a major pre-harvest constraint. It was rated by Nkomo-B, by both men and women, as the most important agricultural constraint. During the late autumn rains and floods of 2000, all villages mentioned the damage caused by floods to their fields and the loss of irrigation pipes and pumps.

Human constraints

General **lack of information** was identified as a constraint by Bloublommetjieskloof and Nkomo-B, but it was mentioned by farmers in other villages too. Some villagers mentioned that the area served by an extension officer seems too large for a single person, and that in the past there had been more extension personnel (BB-Kloof). Villagers asked for specialised training on aspects of food processing, the cultivation of vegetables and other crops, application of pesticides and aspects on marketing. Some also felt that they were induced to apply poor cultivation practices (Ga-Phaahla).

Lack of labour was identified as the major constraint by other villages. This included lack of labour for fencing, clearing fields, weeding, harvesting and shelling. There was a lack of funds to hire extra labour, or pay for herbicides. Widowers in particular found it hard to get hold of labour for granary construction (Mapate). Harvesting of groundnuts and sweet potatoes (Mapate) and njugo beans (Nkomo-B) was considered hard work, with the soil being very hard during uprooting.

Financial constraints

The most general and major constraint was lack of finances to purchase pesticides, hybrid maize seed and other seeds, and inorganic fertiliser. Owing to lack of finances, most villages cannot afford to hire labour, tractors and transport.

The cost of transport (e.g. maize from the field to the house and to town for milling) is a constraint (Basani). Donkeys are also used for transport (at a cost of R30.00 per load/trip) and ploughing. Farmers cannot afford to pay R300 (Nkomo-B) for hiring a tractor. Due to transport constraints mangoes were often left to rot in orchards in Mapate.

2.5 Post-harvest related activities and constraints

Out of the 180 households interviewed using the individual questionnaire, 122 (68%) stated that women were in charge of post-harvest activities, while 31% said that both women and men were responsible (Table 2.5.1). Men normally assist in the grain harvest and are responsible for cash crops, but seldom partake in other post harvest activities. Women are responsible for storage.

Table 2.5.1 A summary of the gender of the person in charge of post harvest activities

	Gender of person in charge of post-harvest activities			
Village	Women	Both	Men	No post harvest activities
Basani	13	17		
Nkomo-B	23	7		
Mapate	22	8		
Vhurivhuri	19	11		
BB-kloof	26	3		1
Ga-Phaahla	19	10	1	
Total	122 (67.8%)	56 (31.1%)	1 (0.6%)	1 (0.6%)

2.5.1 Grain

Maize is the staple crop of the majority of rural people in the Northern Province. It is the staple crop of the villages surveyed in the Northern and Lowveld Districts. Sorghum is the staple crop in the Southern District. Millet is also grown as a staple crop in the Southern District, further away from the Olifants River (Ga-Phaahla). These crops are grown for home consumption and are rarely sold. Surplus may be sold to those in need, or in cases of emergency, for cash. Processed grain (mainly sorghum and millet) can be sold primarily in the form of beer, and this was listed as a source of income where it was produced. The number of households growing traditional, hybrid and mixed (traditional and hybrid) varieties of maize, sorghum and millet and average quantities harvested in 1999 are shown in Table 2.5.2.

Crop harvest and transport from the field

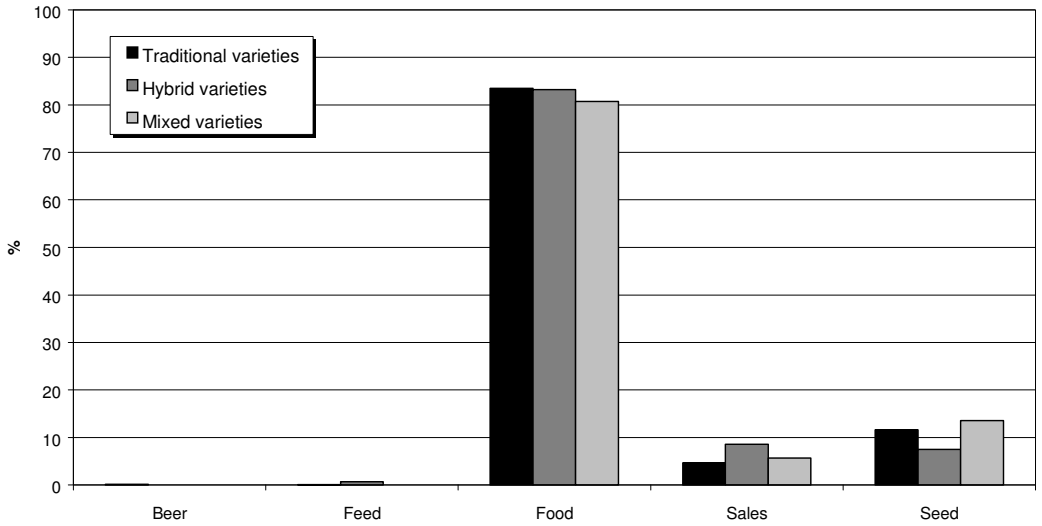
A small portion of the maize crop is harvested as green mealies in March and April by the women and either sold or used for home consumption in all three Districts surveyed. It is cooked and eaten and not stored.

The traditional open pollinated maize varieties are harvested when dry in May, four to five months after planting. Hybrid maize varieties have a shorter growth period and can be harvested after three months of planting. The cobs are picked and placed in heaps or in bags, and then transported either by vehicle (usually hired) or most often in a bag on the head (Table 2.5.3). Lack of transport from the field to the home, as well as the cost of transport, is a post-harvest constraint. Most often farmers who own a mode of transport that can be rented, are also harvesting at the same time and cannot spare transport. Harvesting is a long process involving the whole family. The longer the crop is on the field, the greater the chance of insect infestation, termite and rodent damage.

Table 2.5.2 Number of households growing traditional, hybrid and mixed varieties of the staple grain crops.

Village	Maize				Sorghum				Millet			
	No. of households growing (mean kgs grown/ hhold)				No. of households growing (mean kgs grown/ hhold)				No. of households growing (mean kg grown/ hhold)			
	Trad	*Hyb*	*Mix*	*Comb*	*Trad*	*Hyb*	*Mix*	*Comb*	*Trad*	*Hyb*	*Mix*	*Comb*
Basani	27 (513)	0	1 (400)	28 (509)	5 (272)	0	0	5 (272)	0	0	0	0
Nkomo-B	19 (774)	6 (2033	3 (670)	26 (1112	1 (80)	0	0	1 (80)	0	0	0	0
Mapate	26 (278)	9 (336)	1 (1070	30 (377)	0	0	0	0	0	0	0	0
Vhurivhuri	10 (370)	11 (444)	9 (547)	30 (450)	3 (87)	0	0	3 (87)	2 (160)	0	1 (80)	3 (133)
BB-kloof	15 (241)	1 (160)	0	16 (236)	22 (371)	1 (80)	0	23 (358)	1 (240)	0	0	1 (240)
Ga-Phaahla	8 (293)	2 (560)	0	10 (346)	22 (293)	0	0	22 (293)	13 (185)	0	0	13 (185)

Note: Trad = traditional varieties; Hyb= Hybrid varieties; Mix = mixed varieties; Comb= combined figures for all categories



Note: Out of 180 farmers interviewed, 150 grew traditional varieties, 28 grew hybrid varieties (2 grew hybrid maize just for sale), 14 grew mixed varieties

Figure. 2.5.1 Overview of staple crop post-harvest utilisation in the Northern Province.

Sorghum heads are cut and stacked on a bed of stalks in the field for further drying until transport is arranged. At Bloublommetjieskloof, it is threshed on a swept threshing-floor made from dung in the yard, while at Ga-Phaahla the threshing ponds are in the fields. At Ga-Phaahla a tractor is often driven over the sorghum to be threshed and the lack of a thresher was stated as a harvesting constraint. The demand for transport is high during harvest and harvested sorghum left in the field will rot if late rains occur. Winnowing threshed sorghum can be an itchy task. Millet is harvested in the same way and left to dry, but kept separate from the sorghum. In the Southern District, grain is often mixed with aloe ash to protect against insect damage (20-l ash for twenty 80-kg bags) before it is stored in bags.

Table 2.5.3 Main transport methods used by the different villages to transport the harvested staple crop from the field to the homestead

Village	By headload/ family labour	Animal cart/ own	Bakkie/ own	Tractor-trailor/own	By headload/ hired labour	Animal-cart/ hired	Bakkie/ hired	Tractor-trailor/ hired
Basani	7	2	0	0	1	18	1	4
Nkomo-B	7	0	1	2	0	7	12	4
Mapate	22	0	3	0	2	0	8	0
Vhurivhuri	29	0	1	0	0	0	0	0
BB-kloof	9	2	0	0	3	21	1	3
Ga-Phaahla	3	0	0	1	0	9	0	17
Total	77	4	5	3	6	55	22	28

Storage

Maize is stored on the cob by those farmers who own granaries, but the majority store it shelled in bags inside buildings (Table 2.5.4). Shelling is a laborious task (and often painful to the thumbs) and was mentioned as a serious constraint. Those who store on the cob, shell the maize as required, pound into flour, or shell a larger amount to be milled at a miller. Maize was stored on the cob by 43 % of the respondents, while 45 % stored their staple crop shelled or threshed in bags and the remainder stored the crop shelled but loose. The majority of farmers store the traditional as opposed to hybrid varieties of their staple crops (Table 2.5.5).

Table 2.5.4 Storage form of staple crop in six villages in the Northern Province

	Basani	Nkomo-B	Mapate	Vhurivhuri	BBkloof	Ga-Phaahla	Total
On the cob	21	24	18	12			75
Shelled in bags and drum containers				1		1	2
Shelled/threshed in bags	10	2	5	16	19	24	76
Shelled, loose	3		6	4	6	1	20

Table 2.5.5 Variety of major staple crops stored by farmers in the Northern Province.

	Traditional varieties	Hybrid varieties	Mixed varieties
Basani	26	1	3
Nkomo-B	18	6	6
Mapate	25	8	0
Vhurivhuri	7	15	9
BB-kloof	21	2	0
Ga-Phaahla	25	1	0
Total	122	33	18

Out of the 180 households interviewed in the individual questionnaire, 158 (87.8 %) of the farmers stored their main staple crop, mainly the traditional varieties. Ninety-six stored the crop

in the house. Fifty-eight owned a *dulu*- (or *xitlati*-) type granary (Plate 2.5.2), by 36 respondents in the Lowveld District and 22 in the Northern District, but none in the Southern District. Thirty-seven of these granaries were constructed from poles and mud (predominantly in the Northern District) and 21 of poles only. A further 15 granaries were of brick or brick and poles while one respondent at Mapate used a metal tank as a granary. Forty-five of these granaries were raised on posts less than 1 m, 13 were raised on stones or bricks and 16 were not raised. Fifty granaries had grass thatched roofs while the roofs of 22 granaries were of corrugated iron. The most granaries where at Nkomo-B (60% of respondents owned a granary). 50% of Mapate respondents had a granary, 47% of Basani and 33% at Vhurivhuri. One respondent in Bloublommetjieskloof called her brick granary a *mukutwana*. The *nturuka*-type granary, such as used at Mahlathi in the eastern Lowveld District, was not found in the six villages surveyed (Plate 2.5.2).

Plate 2.5.1 *Dulu* granary, Northern District.

Plate 2.5.2 *Nturuka* granary under construction, Mahlathi, Lowveld District

Only one respondent (Mapate) stated using the NTK deposit system (see Appendix 5 "Millers - NTK Venda roller mills") and one in Bloublommetjieskloof deposited her maize harvest in exchange for maize meal at a shop. Many farmers at Dididi (Northern District) claimed to deposit

their maize with NTK, but this village was only visited during the initial needs assessment training and the individual questionnaire was not conducted there.

The storage period varied considerably by household, and also for each crop. On overall average, maize as the staple crop was stored for 4.5 months (of 113 maize farmers), sorghum as the staple crop for 5.4 months (of 32 sorghum farmers) and millet by five farmers for an average of 4.8 months. The five farmers with maize and sorghum as major staple crop stored their grain for 8.4 months. The minimum period of storage of a staple crop was one month and the maximum 18 months.

Grain protection while in storage

Of the respondents who stored their staple crop, 40 % stated that they protected their major staple grain against insect damage in 1999 (Table 2.5.6). Plant material or ash was used by 48 farmers. It is likely that there is an overlap between these two protectant methods due to the way the question was phrased during data collection. The only plant name recorded on the questionnaires was the bark of *Ndzopfori* (tambooty, *Spirostachys africana*) tree used by one farmer in Nkomo-B. Aloe ash was used by 73% of the farmers in the Southern District who stored their staple crop. The dried leaves of the *Aloe castaneum* are picked (in the moonlight at Ga-Phaahla) and burnt to ash (Southern District).

Table 2.5.6 Methods used by Northern Province farmers to protect their stored staple against insect damage.

	Methods used by farmers to protect their stored staple crop against insect damage						
	Basani	Nkomo B	Mapate	Vhurivhuri	BB-kloof	Ga-Phaala	Total
Ash (possible overlap with plant materials e.g. aloe ash)	4	3	1		20	7	35
Plant materials (possible overlap with ash e.g. aloe ash)	1	1		1	2	8	13
Phostoxin tablets			8	3			11
Smoke	5						5
Synthetic insecticides	1	1	1				3
Put on top of a tree				1			1
Mud				1			1
Used plastic to avoid termites		1					1

It was stated that the ash is effective in controlling storage insect pests for three months, but thereafter loss was half of what was stored. It was claimed that millet is pest-free for a year. Fourteen respondents used synthetic insecticides, mainly aluminium phosphide (Phostoxin®) tablets. Five farmers in Basani village used smoke from the kitchen fire often situated under the granary to protect against insect damage. This was also the main method used in Mahlathi village. Synthetic insecticides such as Blue Death® (carbaryl/gamma BHC) were used by three farmers. Hundred and four respondents did not use any form of insect protectant.

The protectant-use data was also looked at in terms of the person in charge of post-harvest activities; gender of head of household and profession of head of household. The results are shown in Table 2.5.7. It is interesting that synthetic insecticides (although only used by 3 of the households interviewed) were only used in households were men and women both shared the

responsibility of post-harvest activities, and where the head of the household was male. Phostoxin use was as likely to be found in households where women were in charge of the post-harvest activities as households where both men and women were in charge. No obvious correlation was found between protectant use and the profession of the head of the household.

Table 2.5.7 Protectant-use by household in the Northern Province

	Responsible for post-harvest activities		Gender of head of household		Profession of head of household				
	Both	Women	Female	Male	Labourer (Agric/ Gardener/ Cleaner)	Professional (Electrician, Plumber, Teacher, Business)	Farmer	Pensioner	Unemployed
Ash	7	28	15	20	2	1	29	3	1
Plant materials (e.g. monze and possibly includes aloe ash)	6	7	2	11	1	1	10	1	
Put on top of a tree	1		0	1			1		
Smoke	3	2	1	4		1	3	1	
Mud		1	1				1		
Used plastic to avoid termites		1	0	1			1		
Synthetic insecticides	3		0	3	1		2		
Phostoxin tablets	4	7	5	6		2	9		

Only 40% of the respondents who stored their staple crop in 1999 used a preventitive method against rodent damage (Table 2.5.8). The most common method involved the use of the chemical difethialone (Rattex®), mostly by Nkomo-B and Ga-Phaahla farmers, although many farmers said it did not work very well. Sixteen farmers had cats for rodent control while only six used a trap. Ninety-seven respondents stated that they did not apply rodent control. Bags are often stored in the bedroom of the house where the owner can be alerted to rodents at night.

Table 2.5.8 Methods used by farmers in the Northern Province to protect their stored staple from rodent damage.

	Methods used by farmers to protect their stored staple crop from rodent damage						
	Basani	Nkomo-B	Mapate	Vhurivhuri	BBkloof	Ga-Phaahla	Total
Rattex (difethialone)	7	12	3	5	5	12	44
Cats	5	2	1	2	1	5	16
Traps	1	2	1		1	1	6
Sticky glue	1	1					2
Carbaryl/gamma - BHC	1						1
Pour water inside the rats hole	1						1
Mud/cattle dung for sealing entry holes in granary				1			1

Processing

The majority of households (58%) milled their stored staple crops in 1999, particularly in the Northern District (Table 2.5.9). Few households only used manual processing and those who used manual methods (pestle and mortar or stone grinding) and mills (28%), often dehulled the grain manually and then used mills to produce the fine flour or used mills only when they had sufficient funds. Processing of the stored staple crop was mainly the responsibility of women. Three respondents at Bloublommetjieskloof exchanged maize for flour at a shop.

Women in Basani stated that just after harvest, much time is spent milling. This is because milling is an all day task, as they leave early in the morning for the mill and often only return late at night. This keeps them from home and their tasks all day.

Table 2.5.9 Processing of stored staple crop by farmers in Northern Province

	Processing of stored staple crop by farmers in Northern Province						
	Basani	Nkomo-B	Mapate	Vhurivhuri	BBkloof	Ga-Phaala	Total
By hand	6	9	1	3	2	5	26
By hand and milling	13	17		3	17		50
Milling	13	4	30	26	6	25	104
Exchange at shop for maize meal					3		3

Table 2.5.10 Seed storage location used by farmers in the Northern Province

	Seed storage location used by farmers in the Northern Province						
	Basani	Nkomo-B	Mapate	Vhurivhuri	BBkloof	Ga-Phaahla	Total
In house (other than kitchen)	11	6	11	8	21	21	78
In the kitchen	9	5	4	1	2	2	23
Container		4	3	9	1	1	18
In granary	2	6	2	4			14
Closed basket		1	8				9
In granary situated over kitchen	5				1	1	7
Hang in tree on cob		1		1			2
In drums		2					2
In clay pit sealed with mud	1						1
In bags		1					1
Hang in tree on cob		1		1			2
Under a shelter						1	1

Seed storage

Between 23 to 28 respondents out of 30 interviewed per village stated storing seed of their staple crops for the next season's planting. Of the 86.7% households that store seed, 50% stored it in the

house (mostly by respondents in the Southern District) and 15% stored it in the kitchen. Twenty % stored seed in a container (such as a basket, bag, bucket or clay pot) other than in the house and 9% stored it in the granary (Table 2.5.10). Of the respondents who stored seed, 72% applied some form of seed protection against damage by insects and other pests (Table 2.5.11). The use of plant material or ash was the most popular method mentioned (by 52 % of the respondents), especially by farmers in the Southern District. This was followed by soaking the seeds in paraffin (24%), especially in the Northern District, or hanging the maize cobs were it can be permeated by the smoke from the kitchen hearth (by 50% of Basani respondents). Seven respondents claimed to use a synthetic pesticide.

Table 2.5.11 Seed protection methods used by farmers in the Northern Province

	Seed protection methods used by farmers in the Northern Province						
	Basani	Nkomo B	Mapate	Vhurivhuri	BBkloof	Ga-Phaahla	Total
Ash	5	7	1	5	20	8	46
Plant materials	3	1				8	12
Paraffin	2		14	11			27
Smoke	8	2	2	2	1		15
Phostoxin tablets			3				3
Airtight container		1		1			2
Blue Death (carbaryl/gamma-BHC)				1		1	2
Doom (dichlorvos/d-phenothrin)		1					1
Cattle dip					1		1
Cement				1			1
In its own leaves -maize	1						1
Mix with wet or dry manure						1	1

2.5.2 Legumes

Njugo beans and cowpeas (pods and leaves) are harvested at the same time. Digging up of the njugo beans when the soil is hard was considered an extremely laborious task. Beans are also picked as green beans when young in April. Transport from the field is in bags with aid of family (on the head) which is also a hard task and was listed as a constraint. Beans are threshed, winnowed and dried in the sun with the leaves, or shelled (Northern District) by women and this stage is often viewed as a social event. The Njugo beans and cowpeas are stored in bags in the house, but insect pests cause damage and are seen as a serious problem. In the Southern District, the Njugo beans and cowpeas are admixed with aloe ash prior to storage. Weevils quickly become a problem, as the aloe ash treatment is only effective for three months. In households in the Lowveld District, the Njugo bean and cowpea harvest is often sufficient to last for a year and any surplus is sold amongst the community or to strangers from afar (by word of mouth). At Mapate and in the Southern District only small quantities of beans are produced, and due to the small quantity harvested, pests are not considered a serious problem. Some farmers mentioned that the faster they consume the beans, the smaller the quantity lost to insects. However, insect

damaged beans are not eaten and are fed to the chickens. Seed is stored untreated in any closed container.

In the individual interviews, storage insect pests were the major post harvest constraint and also the most often first ranked post-harvest legume constraint (Fig. 2.5.2). Rodents followed by lack of transport from field to home were the next most important constraints. Termites, drying problems and mould were also mentioned.

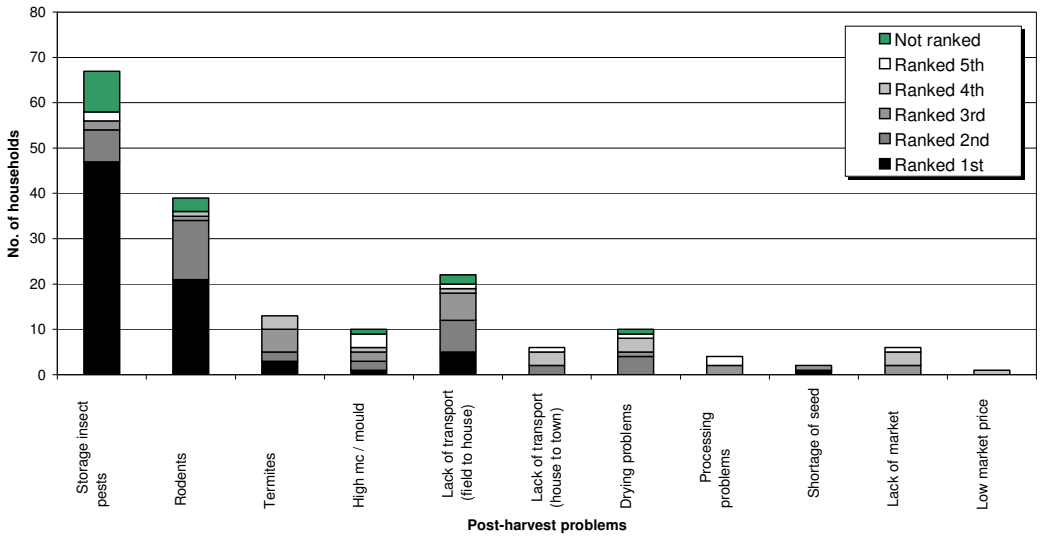


Figure 2.5.2 Ranked post harvest njugo beans, cowpeas and other legume problems experienced by farmers in the Northern Province.

2.5.3 Oilseeds

Groundnuts are uprooted and turned upside down to dry. The pods are separated from the plant by hand and put into bags to be carried by headload to the home. The soil is very hard during uprooting and lifting. Bending down as well as separating the pods from the plants is a laborious process. Once separated, pods are spread on a sheet of corrugated iron to dry. Groundnuts are usually stored unshelled (Northern District) often for the duration of up to a year. Bags containing the shelled groundnuts are sewn closed (Lowveld District). Rodents are the major post harvest constraint of groundnuts, and were also the most often first ranked problem (Fig. 2.5.3). Rodents also damage groundnuts while still in the field. Lack of transport (field to home) and storage insect pests were the next major problems. Lesser problems were termites, problems with drying and lack of market. The harvesting and post-harvest activities of groundnuts are the responsibility of women.

2.5.4 Vegetables

Production, harvesting and storage of vegetables for home consumption are the responsibilities of women. Men only grow them as cash crops. Leaves of legumes (cowpeas and beans) and cucurbits (pumpkins) are picked as a vegetable. The picking of the leaves is usually the earliest harvest of all the crops produced in the season. Picking leaves was stated to be easy, but a

continuous task. Transport, in dishes or in bags, is by headload, or harvested together with the other crops if another form of transport is available. Leaves prepared for storage are cooked, dried in the sun on a flat surface such as a sheet of corrugated iron or the threshing floor, and then stored in bags or pots. Younger leaves are preferred for immediate consumption. It was stated in all three Districts surveyed that no insect damage was experienced in dried and stored leaves.

Pumpkin (fruit) are picked with the stalk to prevent rotting and stored in the house (Southern District) or under a *dulu* (Lowveld District). Pumpkin seed and flowers are also dried and stored. Okra fruit and leaves are used for immediate consumption and not stored. Vegetables grown under irrigation (such as the cabbage varieties, spinach and tomatoes) are either consumed cooked (not stored), or sold as a cash crop.

Problems with drying vegetables was the most often first ranked constraint. Insect pests were the major constraint listed on post-harvest vegetables experienced by farmers in the household interview. Other important problems were the lack of transport from field to home, rodent damage, moulds and rotting.

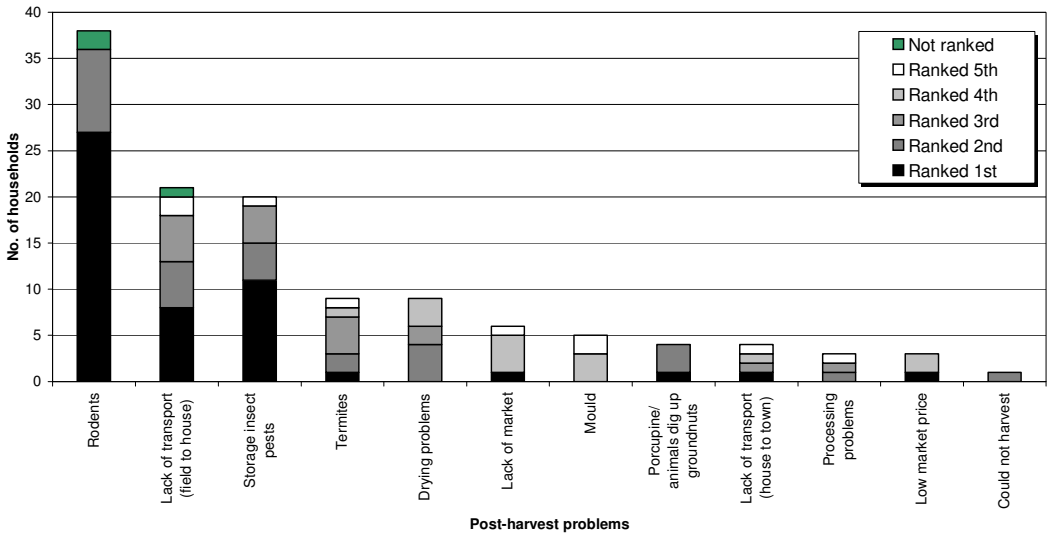


Figure 2.5.3 Ranked post harvest groundnut problems experienced by farmers in the Northern Province

2.5.5 Fruit

Fruit is a minor crop and the small yield is consumed fresh and not stored. Insect pest damage was the biggest constraint, followed by lack of market and lack of transport (Fig. 2.5.5). At Mapate, mangoes are grown in orchards and part of the yield is sold to the achaar (chutney) factory. Transport to the factory is a constraint as the cost of transport is often higher than the income from sale due to competition in season. Most of these mango orchards are also of the older high fibre varieties and are undesirable for the market. Most often the mangoes are left to rot in the orchard.

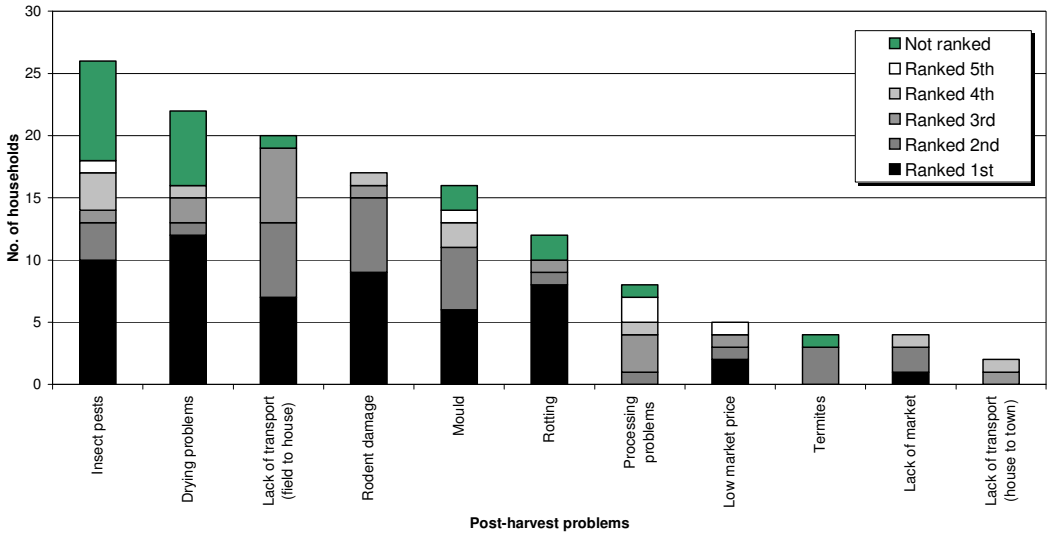


Figure 2.5.4 Ranked post-harvest vegetable problems experienced by farmers in the Northern Province.

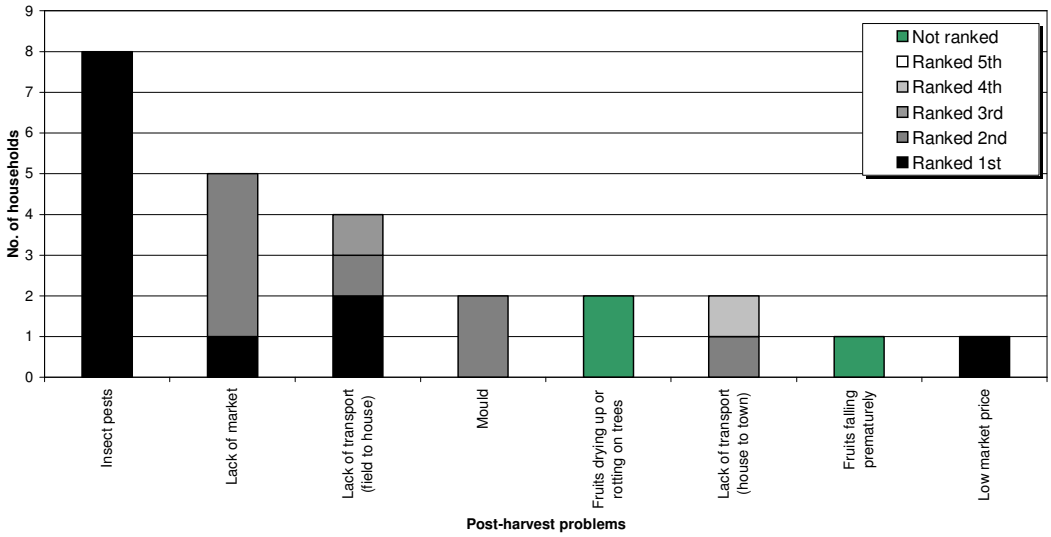


Figure 2.5.5 Ranked post-harvest fruit problems experienced by farmers in the Northern Province.

2.5.6 Root and tuber crops

Sweet potato was the only root and tuber crop produced, and only in the Northern District. Harvesting was mentioned as hard work. Sweet potatoes are typically left in the ground until required. The crop is used as a barter item, especially in exchange for maize at the end of season. Only two households out of the 180 interviewed during the questionnaire survey produced sweet potatoes. Problems after harvest included insect damage, rodents and the lack of transport from field to home.

2.6 Development and dissemination of improved technology

A Venn diagram technique was used in the community group exercises to determine the sources of information to which the villagers have access, the direction of information flow, the importance of each as well as the type of information supplied. Indications were also made as to whether the sources were within the community or outside the community. In all villages (except for Nkomo-B and Vhurivhuri), the exercises were done in separate male and female groups. An example of the information flow Venn diagram for Vhurivhuri (men and women) is given in Fig. 2.6.1.

2.6.1 Information flow patterns

During the survey the farmers mentioned a total of 26 sources of information. These are listed according to their frequency in Table 2.6.1.

Table 2.6.1 Sources of information: From top to bottom, in declining rate of frequency mentioned, the sources listed by men and women of all villages surveyed.

Frequency the information source was mentioned	Sources of information mentioned by Northern Province communities
Most frequently mentioned	NPDAE extension Radio
	Friends
	Television
	Tribal authority School children (students) Newspaper
	Parents (elders)
	Chief
	Co-operative
	Health Dept Animal health officer Magazines Agricultural shows Research and surveys Commercial farmers Letters
Least frequently mentioned	Headman Husbands Clubs School teachers Magistrate office Work stations Advertisements Cellular phone

At Nkomo-B and Vhurivhuri, there was an insufficient number of participants during the information flow exercise and so it was not possible to separate the farmers into reasonable-sized groups of men and women. Of the communities separated by gender orientation, women listed more information sources than men did (Table 2.6.2). For example, Bloublommetjieskloof

women listed twice as many (12) information sources than their male counterparts (6), but at Mapate, the sources of information mentioned by male and female was almost equal (6 sources listed by women and 7 sources by the men). Of all the information sources listed above, the NPDAE extension and radio were the most widely used sources of information mentioned by both male and female (Table 2.6.1).

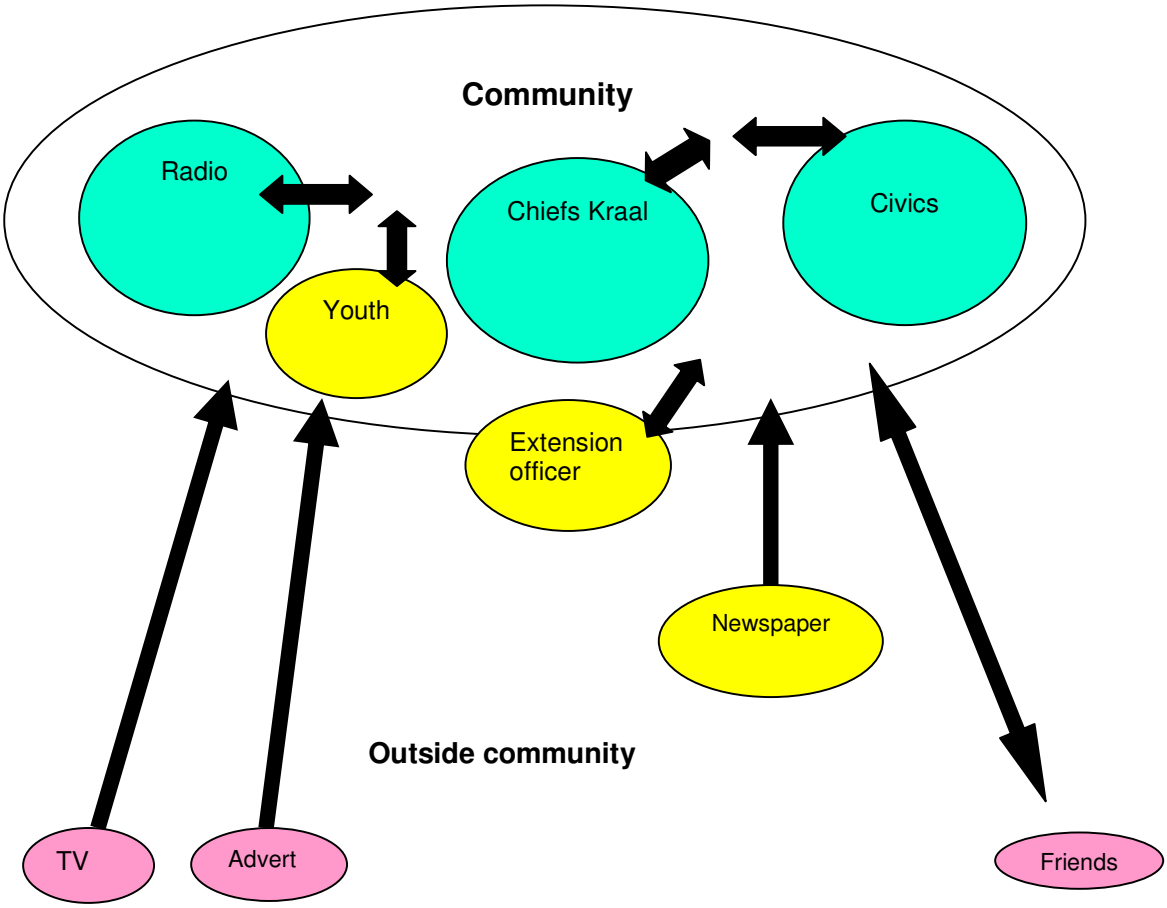


Figure 2.6.1 Venn diagram indicating the information sources and direction of information flow as perceived by the men and women group of Vhurivhuri, Northern District, during the survey in Northern Province. Size of circles (sources) indicates the importance of the information received or the availability thereof. The chief, radio and the Civics organisation are the important sources, while youth (school children or students), the NPDAE extension officer and newspapers are intermediate sources of information. The extension officer is on the border of the community. Arrows indicate flow of information; double arrows indicate a two-way form of communication, while single arrows indicate flow of information from source to the villager (e.g. television and newspapers). In this case "friends" are placed further away from the other sources, as their information is considered not reliable, but information flow is two-way.

Table 2.6.2 The number of information sources listed by the different genders of each village in the survey

	Gender of group participants		
Village	Women	Men	Men and women
Basani	10	8	
Nkomo-B			6
Mapate	6	7	
Vhurivhuri			9
Bloublommetjieskloof	12	6	
Ga-Phaahla	10	7	

There are three radio stations in the Northern Province and each primarily targets a specific ethnic group. Each radio station broadcasts in the language largely spoken in that particular region, namely, Phalaphala FM in Tshivenda (Northern District), Thobela FM in Sepedi (Southern District) and Munghana Lonene FM in Xitsonga in the Lowveld District. These radio stations, as mentioned by farmers, act as another source of information. Phalaphala FM has a daily agricultural programme from 04h45 to 05h00, and Thobela FM broadcasts an agricultural programme from 11h00 to 11h25 on Mondays. The Munghana Lonene FM Programme is sponsored by NPDAE. At the moment (2000), the programme largely focuses on land claims issues and is available from 19h00 until 20h00 every Friday.

The type of agriculturally-related information provided by the information sources listed by the communities surveyed is summarised in Table 2.6.3 below.

Table 2.6.3 Information source and the type of agriculturally-related information provided, as listed by all three Districts surveyed, in decreasing order of frequency of mention

Information source	Type of information provided
Agricultural extension officer	Provides farmers primarily with agricultural and crop-related information
Radio	Provides farmers with all sorts of information (agricultural included)
Friends	Provide each other with all sorts of information (this also include farmer-to-farmer linkages)
Television	Provides a wide variety of information (e.g. entertainment, news etc)
Tribal authority	Provides farmers with all sorts of information. The communities get contacted through the tribal authority.
School children (students)	Mainly provide information on school related issues
Newspaper	Provides all sort of information
Parents and elders	Agriculturally, it involves traditional methods of farming
Chief	Same types of information as supplied by the tribal authority
Co-operatives	Largely play an advisory role in agricultural matters
Health Department officials	Provide information on health-related issues such as hygiene, nutrition, and infant care.
Animal Health extension officers	Provide information on livestock related issues (e.g. disease control)
Magazines	Magazines such as *Farmer's Weekly* provides agricultural information
Research organisations	Research organisation (e.g. ARC) provides information on agricultural issues.
Commercial farmers	Provide information indirectly on agriculturally related issues as some respondents are working as labourers on commercial farms.
Letters	Answers to queries
Headman	Same role as tribal authority
Husbands	Provide information on traditional methods or new-found information on farming in general
Clubs	A forum for the sharing of new-found information on farming experiences
School teachers	Provide information on school related matters
Magistrate's office	Provides information largely on branding of livestock
Advertisements	Provide information on various items offered by various shops e.g. farming implements
Cellular phone	Owners of cellular phones can contact radio stations for further information
Work stations	Same as friends.