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## CHAPTER TWELVE

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### THE POTENTIAL FOR CREATING ADDITIONAL RURAL LIVELIHOODS IN AGRICULTURE AND THE RURAL NON-FARM SECTOR IN SEMI-ARID AREAS: A CASE STUDY IN THE NORTHERN PROVINCE

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#### Introduction

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The aim here is to estimate the potential for creating additional livelihoods in a typical semi-arid area under various assumptions about farm activities, farm size and technology. As such the paper will endeavour to provide policy makers with estimates of the impact of a land reform programme on the amounts and types of rural livelihoods.

In 1993, through a collaborative effort between the Land and Agricultural Policy Centre and the World Bank, a team of South African and international researchers provided preliminary estimates on the net gain or loss of jobs in the aftermath of redistributive land reform (see LAPC 1993 and Van den Brink *et al* 1996). This research is an effort to refine these estimates in a semi-arid region.

The existence of rural growth or farm/non-farm linkages, the belief that smaller scale farms are more labour-intensive, and hence the view that they have stronger linkages, are the three fundamental assumptions for the notion that rural restructuring or land reform could generate additional livelihoods. It is argued that a land reform programme could lead to increased farm income and, through the existence of these linkages, contribute to growth in the rural economy and in particular the rural non-farm economy. This positive indirect contribution associated with a land reform programme could be one of the major benefits of, and thus motivation for, land reform.

The international literature on agricultural growth linkages gives considerable evidence on the linkages generated by technological change in agriculture and investment projects in agriculture. However, little evidence on the linkage effects of land reform programmes on farm income and output, secondary growth and poverty reduction emerges from this debate (Lipton 1993).

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<sup>1</sup> Comments and suggestions by Herman van Schalkwyk are acknowledged with thanks

Considering the assumption that reform will also have an impact on other economic sectors through the linkage effect it would be more correct to assess the livelihood potential in an economy wide context.

For this reason it was initially envisaged that this chapter would use the input-output and SAM methodology to estimate the livelihoods that can potentially be generated. However, due to questions relating to the appropriateness of the methodology and the complete absence of micro level data and examples of post-reform models, it was decided to focus on only one district, estimating the potential to generate livelihoods given the agro-ecological potential of the particular district.

The farming systems in semi-arid environments are largely determined by the unstable and insufficient water balance, and as a result extensive livestock production and limited rainfed cultivation are the typical farming systems. Where water is available, either from storage dams or boreholes, cultivation under irrigation is also to be found.

Lipton (1995) argues that it is unlikely that rainfed agriculture would generate sufficient livelihoods to support, say, a growth of 1,5% annually in rural population and a minimal improvement of 2% in per capita income. It is therefore argued that livelihoods can be sufficiently increased only through expansion of irrigation. Or stated differently: irrigation remains the only sustainable source of increased livelihoods in semi-arid areas.

Although this argument can be supported, it assumes sufficient water is available for the expansion of irrigation. Africa has similar soil-water averages and distribution to those of Asia, and should therefore have the ability to expand irrigation. However, it is not the case for semi-arid areas in southern Africa which are water-insecure and prone to drought conditions.

In semi-arid regions of South Africa, including the Northern Province, it has been observed over the past decade that storage dams and boreholes failed to provide a secure supply of water for irrigation purposes – instead boreholes are drying up, and rivers and dams supplying major irrigation schemes had been dry for the three to four years before the record breaking rain season of 1995/96.

The dying citrus orchards at Zebediela and dying citrus and mango trees in the Tzaneen region towards the end of 1995 were examples of the effect of the water shortage in the Northern Province. The reality also strikes when you talk to farmers and communities. The issue of water is always at the top of their concerns.

We can list criticisms of previous irrigation policies, such as inequitable access to water resources, cheap water prices, inefficient allocation of water, etc. From an economic standpoint it can be argued that reallocating and redistributing control over water supplies to people or institutions that use them effectively, efficiently and labour-intensively could be a solution.

Institutional change and a change in the focus of research technology which leads to the substitution of labour for water should be important. This would perhaps address some issues but, given the reality of limited water supply, it is unlikely that irrigation alone could generate sufficient livelihoods.

We shall therefore also have to consider rainfed agriculture and extensive livestock production as possible avenues to additional livelihoods. Perhaps smaller land holdings, change in activity mix and shifts in land use could also help.

Given the riskiness of agricultural activities in the research area, we are at the outset sceptical about the potential for livelihood generation in semi-arid regions. Hopefully our analyses will prove the contrary.

Non-farm or off-farm activities could be important in securing, in combination with agricultural activities, sustainable livelihoods. The second half of the chapter will pay particular attention to non-farm enterprises in rural areas.

The first half of the chapter considers the livelihood potential of agriculture in the Northern Province. The characteristics of the Northern Province and the current mix of agricultural activities are discussed first, to provide the regional setting for the research. The alternative crops and farming systems are considered next, after which the additional agricultural livelihoods in a post reform situation are estimated within the Potgietersrus magisterial district.

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## Characteristics of the research area

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The Northern Province was selected as the research area because of the extreme poverty and the pressure for land reform. Some socio economic characteristics of the province are briefly discussed here.

### *Employment in the province*

The agricultural sector, employing 12% of the economically active population, is the third largest employer in the region. The mining sector tops the league with 26% of the economically active population. Community and social services, including education, employs 16%.

Based on employment statistics of the former Lebowa it is evident that agriculture is the third largest employer (15% of economically active population) after community and social services (27%) and informal activities (21%). The recorded employment statistics for agriculture do not include smallholder and subsistence households, and therefore underestimate the persons involved in agriculture in Lebowa.

Based on the 1994 October household survey it is estimated that the commercial farming sector in the province employs approximately 140 000 workers on 5 455 farms covering 5,7 million hectares – thus implying on average a labour/land ratio of one worker for every 40 hectares farmed.

Unemployment in the region is high, and many households depend on remittances from family members. The October 1994 household survey estimates that 571 000 individuals (or 49% of the economically active population) are not employed in the formal economy and 533 000 of them reside in the rural areas. Although this figure seems high, many of the so-called unemployed do make a living through a range of informal activities.

### *Poverty levels*

The Northern Province is one of the poorest provinces, with almost 70% of the population living below the poverty line, estimated at R740/month or R8 880 per annum in rural South Africa.

A measure which incorporates the incidence of poverty (head count) and the depth of poverty is the poverty gap. This is calculated by summing the differences between the income of each poor household and the poverty line. The poverty gap is theoretically the minimum government transfer needed to eliminate poverty. The per household poverty gap in the Northern Province is R4 845; summing across households the total for the province is R2 948 million and for selected districts the following:

Potgietersrus:	R 28,7 million
Pietersburg:	R 13,6 million
Waterberg	R 16,5 million
Mokerong (former Lebowa):	R285,7 million
Sekhukhuneland (former Lebowa)	R300,7 million
Seshego (former Lebowa)	R183,7 million
Nebo (former Lebowa)	R232,6 million

(Source: Whiteford *et al.*, 1995)

Clearly the intensity of poverty is much more severe in the former homeland districts. The incidence of poverty in the Northern Province is also highlighted by the poverty head count. Some 62% of households and 69% of individuals live in poverty, which makes the Northern Province one of the poorest provinces in the country.

Figures on the poverty head count in the Potgietersrus district are, however, not available, but the human development index for the district gives a sense of the inequalities between black and white. For blacks the human development index is estimated at 0,25 and that for whites 0,92.

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### *Agriculture in Potgietersrus district*

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To determine the potential for creating livelihoods in semi-arid areas it was decided to select the Potgietersrus magisterial district, which has many characteristics of the Northern Province and of a typical semi-arid region, with annual rainfall ranging between 400 and 600 mm per annum.

It is perhaps the district which could experience the biggest pressure for land reform and rural restructuring, given its proximity to the former homeland territories. The first land reform pilot programme in the Northern Province is also being developed in the Potgietersrus district in the Gillenberg area. This might provide some idea as to what is possible in terms of the creation of livelihoods through agriculture.

As a first step, it may be useful to summarise the district's farming structure, current land use and land use potential.

The district covers an area of 1 599 700 ha with a total number of 1 429 owner-operator farms and 464 farms farmed by non-resident part-time farmers.

The land-use pattern (1993) is presented in Figure 1. The importance of extensive cattle and game ranching can be deduced from the large portion of land used, and which is suitable only for extensive grazing.

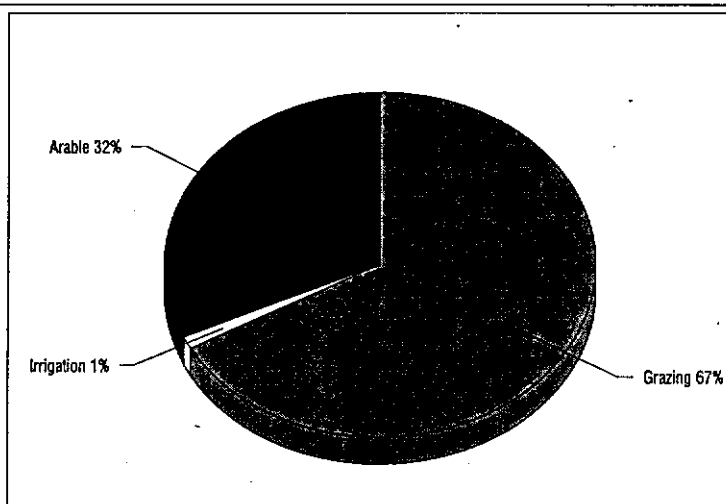


Figure 1: Land-use in the Potgietersrus magisterial district, 1993.

Source: Booyens (1993)

This is fairly typical of land use patterns in the Northern Province; land use for grazing purposes is 70 to 75% of total agricultural land, indicating the limited arable potential, mainly as a result of limited water resources (for irrigation purposes) and low annual rainfall.

Grazing capacity in the province varies between eight and 15 hectares per livestock unit (LSU), further emphasising the limited agricultural potential and confirming its semi-arid status. In the Potgietersrus district the grazing capacity varies between eight and 11 hectares per LSU.

The share of land used for dryland crops in Potgietersrus is considerably higher than elsewhere in the province. This is partly due to the large arable area of the Springbokvlakte where cotton, maize, wheat, sunflower and groundnuts are cultivated. The limited rainfall makes dryland cultivation a much more unlikely proposition in other areas of the province.

Although the deep fertile soils of the Springbokvlakte give the impression of good arable land, small and variable rainfall often results in crop failures. Although large areas are cultivated each year, average to low yields and complete crop failures are more the rule than the exception. Farmers often fail to recover production costs, and their financial survival is largely dependent on off-farm ventures such as shops, butcheries, etc.

The crop failures in the past can to a large extent be attributed to the fact that farmers were planting maize and other grain crops, which are generally regarded as not suitable for local conditions. The riskiness of many agriculture ventures in the district could largely be attributed

to the cultivation of 'wrong crops' made artificially attractive by subsidies and guaranteed markets and prices.

## The current mix of farming activities

The Potgietersrus district consists of three homogeneous farming areas. The typical mix of activities and a description of the typical farms in each will briefly be summarised. These typical farms were based on previous studies and are included to give an overview of current farming activities. The concept of typical farms can be problematic; therefore no conclusions as to the financial viability, representativeness, etc should be drawn from these presentations. The three homogenous farming areas discussed are: the cultivated area of the Springbokvlakte and Waterberg; the central mixed and sour mixed Bushveld, and the dry Bushveld in the northern parts of the district; and, irrigation farming in the Hartebeespoort region.

### The cultivated area of the Springbokvlakte and Waterberg

In this important but drought prone arable area, arable land suitable for dry land cultivation covers approximately 410 000 ha. Cotton and sunflower are the main crops, as in 1992:

Maize	41 000 ha
Grain sorghum	57 000 ha
Sunflower	123 000 ha
Cotton	205 000 ha
Groundnuts	22 000 ha
Wheat	20 500 ha

Source: Booyens (1993).

Although some farmers still cultivate maize and wheat, these crops are less suited to the climatic conditions than cotton, sunflower and groundnuts. The highest yield for maize under dryland conditions is only around 1,5 tons per hectare, with average yields around 0,6 tons per hectare. Previous price support measures made this a viable farming enterprise. But from 1987 market and price deregulation and subsequently drought, made maize production less viable. With further deregulation and less protection other crops could also become less viable.

About 7 000 hectares of land are irrigated by groundwater. The crops cultivated on this land are maize (3 080 ha); tobacco (1 960 ha); cotton (1 980 ha); onions (200 ha); cabbage (300 ha) and citrus fruit (400 ha).

Natural grazing covers around 99 100 hectares which are utilised by a herd of approximately 29 000 beef cattle and 17 000 mutton sheep.

Using information from the Directorate of Agricultural Economics (Strydom *et al*, 1994) three representative farms for this area were constructed at 500 ha, 850 ha and 1 145 ha (Table 1). The study (*ibid*) noted that the implements and machinery on all three farms were old and would require replacement in the near future, which would probably worsen their financial position. It was also determined that the financial position of all three farms relied heavily on the price of cotton, which recently has been largely influenced by the world price.

Table 1: Typical farms in the Springbokvlakte (1993/94)

	500 ha farm		850 ha farm		1145 ha farm	
Land use (ha):						
Dry land cash crops		350 ha		595ha		687ha
Planted pastures (dry land)		100 ha		170 ha		229 ha
Grazing		45 ha		77 ha		218 ha
Other		5 ha		8 ha		11ha
Crop mix (ha):						
Grain sorghum		150ha		179ha		206ha
Sunflower				127ha		128ha
Cotton		200ha		200ha		250ha
Wheat				89ha		103ha
Animals*:						
Current number of LSU's		14		40		77
Potential herd (LSU)		80		130		180
Labour (permanent):		12		15		15
Per ha operated		41ha/labourer		56ha/labourer		76ha/labourer
Per ha cultivated		29ha/labourer		39ha/labourer		46ha/labourer
Labour costs (% share of fixed costs)		32,5%		32,0%		26,2%
Financial summary	Total	Per ha	Total	Per ha	Total	Per ha
Gross Farm Income:	R148 192	R296,38	R217 402	R255,89	R257 974	R225,31
Fixed Costs	R 74 379	R148,76	R 94 470	R111,19	R115 255	R100,66
Net Farm Income	R 73 379	R147,63	R122 933	R144,69	R142 719	R124,65
Farm Profit	R 39 949	R 79,90	R 55 261	R 65,04	R 82 627	R 72,17
Other Income	R 12 000		R 12 000		R 0	
Spendable Income	R 48 561		R 59 106		R 74 879	
Household expenses	R 48 000		R 48 000		R 60 000	

\* On planted pastures and natural grazing  
Source: Strydom et al (1994)

## *2. The mixed and sour mixed Bushveld and the dry Bushveld*

This region is typified by extensive cattle ranching in the central and north western areas. Around 946 000 ha (or 90%) of the 1 057 000 ha are used for grazing. Grazing capacity varies from nine to 11 ha per LSU. It is estimated that the cattle herd is around 113 800 head.

A survey by the Directorate of Agricultural Economics (1993) of the economic and financial position of extensive stock farmers in the north western Bushveld provides useful information relevant to Potgietersrus (Table 2).

Table 2: Average figures for typical farming groups in the north western Bushveld (1992/93)

	Bottom third	Top third	Average
Total farm size	1 926ha	2 621ha	2 280ha
- % cultivate	7%	5%	5%
- % grazing	93%	95%	95%
Number of LSU:			
Beef cattle	175	211	196
Mutton sheep	3	4	4
Gross income per LSU:			
Beef cattle	R88	R358	R220
Mutton sheep	(R177)	R358	R 85
Capital investment per ha:			
- land	R230	R224	R224
- fixed improvements	R95	R 74	R 83
- vehicles and machinery	R65	R25	R39
- livestock	R104	R91	R100
Total investment:	R494	R224	R447
Labour costs:			
Casual labour (% of allocatable costs)	4,35 %	2,31 %	3,0%
Regular labour (% share of fixed costs)	10,25 %	13,77 %	12,65%
Total labour (% share of total costs)	14,6 %	16,08 %	15,65%
Financial summary:			
Gross farm income/ha	R17,69	R37,34	R27,70
Total costs/ha	R92,05	R39,36	R58,30
Net farm income/ha	(R74,37)	(R2,02)	(R30,63)

Source: Directorate of Agricultural Economics (1993)

### 3. Hartebeespoort and Sterk River irrigation areas

Agricultural activities in the irrigation areas of the Potgietersrus district have been hampered over the last two decades by regular water shortages as a result of limited rainfall in the catchment areas of the main supply dams such as the Doorndraai dam on the Sterk River. The land use pattern is: 1 300 ha irrigation land, 1 100 ha dryland and 3 108 ha natural grazing.



On the irrigated land the following crops are usually produced: maize (seed) (559 ha); cotton (182 ha); groundnuts (169 ha); tobacco (104 ha); a variety of vegetables (182 ha), and wheat (65 ha). A typical farm can be characterised as follows:

Table 3: A typical farm in the Sterk River irrigation area (1989)

Land use:	
Dryland	42 ha
Irrigation	39 ha (original irrigation plots = 20 ha)
Grazing	65 ha
Other	4 ha
Total	150 ha (64% of farms are less than 200 ha)
Crop mix:	
Maize seed	56%
Tobacco	31%
Other	13%
Capital investment per farm:	R750 000 R5 000/ha
Labour	18 permanent labourers R200 wage per month
Financial summary:	
Gross farm income	R165 909
Total farm costs	R163 692
Net farm income	R 2 217 (Only 30% of farmers have NFI > 0)

Source: Directorate of Agricultural Economics (1990)

### Employment on commercial farms in the Potgietersrus district

Taking the average information from the representative farms discussed above an estimation of current employment on commercial farms in the district was made:

Table 4: Number of permanent workers on commercial farms

	No of farmers	Average number of permanent workers	Total
Springbokvlakte	595 farmers	12	7 140
Bushveld	748 farmers	6	4 488
Irrigation schemes	86 farmers	18	1 548

According to these figures commercial agriculture in the Potgietersrus district provides full-time employment for 13 176 workers. The 1988 agricultural census estimated a total workforce on commercial farms in the Potgietersrus district of 10 059. A further 12 333 temporary and seasonal workers are also employed by farmers for piece work during harvesting and planting seasons. On average the temporary workers were employed for 25 days a year — thus providing a further 1 541 livelihoods (or work years). In addition agriculture provides a

fairly decent livelihood for 921 full-time farmers and their families. Total current agricultural livelihoods in the Potgietersrus district can therefore conservatively be estimated at 15 946.

Cash wages paid by farmers varies between R200 and R300 a month. In addition workers receive some payment in kind, such as a bag of maize meal (worth R90) a month and mutton and beef on occasion. Estimates for the value of in kind remuneration per labourer vary between R4 500 and R5000 per labourer per annum. Total remuneration per labourer therefore typically amounts to between R7 100 and R8 600 a year. This is somewhat lower than the R9 900 a year cash wage paid to unskilled workers by the provincial government.

### The potential of alternative farming options

Before estimating potential agricultural livelihoods in a post-reform scenario in the Potgietersrus district, it is necessary to consider the agricultural potential and the suitability of alternative crops and animals. The suitability of each of the crops was tested in terms of the natural potential of the three homogeneous farming areas and the following are the crops/animals which are considered to be well adjusted to the natural circumstances:

Table 5: Yields of well adjusted and low risk crops for the three homogeneous farming regions

	Springbokvlakte			Bushveld grazing			Irrigation areas				
	Crop	Yield potential (t/ha)		Crop	Yield potential (t/ha)		Crop	Yield potential (t/ha)			
		High	Avg. Low		High	Avg. Low		High	Avg. Low		
<b>Dryland</b>	Sunflower	1,2	0,6	Cotton	0,8	0,6	0,5	Grndnuts	1	0,6	0,4
	Cotton	1,2	0,75					Cotton	1,2	0,5	0,3
	Grndnuts	1	0,5								
<b>Area</b>	410 000 ha			90 000 ha			1 100 ha				
<b>Irrigation*</b>	Tobacco	2,2	1,5	Tobacco	2	1,5		Maize	6	3,5	2,5
	Maize	8	4	Cotton	3,3	2,2		S-Maize	6	3	2
	Cotton	3	2	Potatoes	25	22		Ground	2	2	1,5
	Cabbage	70	50	Tomatoes	50	35		Tobacco	1,8	1	0,7
	Onions	35	25	Onions	35	25		Wheat	5	3	2,8
	Citrus	40	30	Pumpkin	25	20		Soybean	1,5	1	0,8
				Cabbage	45	30		Drybean	1,8	1,4	1
				Citrus	90	86		Peas	6	4,6	4
<b>Area</b>	8 000 ha			3 000 ha			1 300 ha				

\* Irrigated land in the Springbokvlakte and the Bushveld grazing regions rely mainly on underground water sources through boreholes. The irrigated areas refer to specific irrigation schemes such as the Sterk River irrigation scheme.

With natural grazing being the dominant land use option it is also important to consider the animals well adjusted for the three homogeneous farming regions. Beef cattle are common on

all the farms in the district and are well adjusted to the natural and climatic conditions. Dairy cattle, however, are not a viable option, and although some farmers keep mutton sheep, these animals are not suited to conditions in the district and are thus not common. The potential levels of meat production are indicated in Table 6.

Game farming is becoming an increasingly popular and profitable enterprise, especially in the extensive grazing areas. The main sources of income from game farming are mainly trophy hunters, game rides, accommodation, and biltong and venison production. Impala and kudu are common in the region, and numbers on farms in the Bushveld grazing regions are estimated at around 8 500 kudu and 42 000 impala.

Intensive animal production, mainly pork, eggs and broilers, are found in some parts of the Potgietersrus district. The number of pigs on farms in the Springbok flats is estimated at 2 000, which produces around 128 000 kg of pork meat per year. In the central Bushveld region the number of pigs is estimated at 1 000 with production estimated at 117 000 kg. Broiler production in the same region is around 156 000 kg (20 000 birds per cycle).

Table 6: Potential animal production levels in the three homogeneous farming regions

	Springbok Flats Production (kg/ha/yr)		Bushveld grazing Production (kg/ha/yr)			Irrigation areas Production (kg/ha/yr)			
	High	Avg. Low	High	Avg.	Low	High	Avg.	Low	
Beef cattle	6	5	—	10	5,6	5	12	5	3
— on pastures	45	25							
Grazing area	103 612 ha		946 000 ha			3 108 ha			
Pastures	15 000 ha								

### Estimating the livelihoods potential

With the knowledge of viable crop and animal enterprises for each of the farming regions it is now possible to speculate about the number of agricultural livelihoods in a post reform scenario with farmers (including farm labourers on white commercial farms) gaining access to land, support services and finance. Since examples and data of smaller scale, more labour-intensive farming operations in semi-arid areas are not readily available, a number of assumptions regarding capital, technology and enterprise gross margins had to be made – thus emphasising the speculative nature of the exercise.

The only source for data on farm and enterprise budgets is farmer study groups which often consist only of leader (and often large scale) farmers in a particular area. The available data is therefore not suitable for use in modelling smaller scale farms operating with lower levels of technological development and lower capital intensity. For this reason it was necessary to scale down some of the basic parameters of current commercial farms.

However, smaller scale farms operate within a different set of institutional and technological relations and it is therefore not correct to view them as miniature versions of large scale farms.

Nevertheless, due to a lack of representative models we had no choice but to do some downsizing of commercial data.

Due to the non-availability of enterprise budgets for the smaller scale, more labour-intensive farms envisaged in a post reform scenario, some 'guesstimates' were made to get to the 'new' budgets. These were based on information obtained from the COMBUD enterprise budgets (Directorate Agricultural Economics 1994) and information from surveys of agricultural activities in the former homelands.

Yields, and thus gross receipts, were scaled down, and production outlays were considerably lower due to the less input intensive and capital-intensive practices of the envisaged new farmers. The budgets used as the basis for this purpose were useful since the majority incorporated hand harvesting practices.

As a result, scaling down (or 'guesstimates') was required only on the input side. It was assumed private entrepreneurs would provide ploughing services to farmers. Current rates charged by these small contractors were therefore substituted for machinery costs, which tend to be somewhat higher on the more capital-intensive farms. Throughout it was assumed that medium technology would apply.

A sense of the 'scaling down' exercise can be gained from Table 7 where a comparison is made between enterprise budgets for large scale commercial farms (COMBUD 1994) and enterprise budgets used in the modelling exercise. Since the model was given the opportunity to choose between hired and household labour, the gross margin of the new budgets does not include labour costs, which are calculated within the model. The new budgets included the labour requirements per hectare that were incorporated into the model.

Table 7: A comparison between COMBUD enterprise budgets and selected budgets used in the modelling exercise

Item	Cotton (irrigation)		Groundnuts		Sunflower		Tobacco (irrigation)	
	COMBUD	New	COMBUD	New	COMBUD	New	COMBUD	New
Yield/ha	2 500 kg	2 200 kg	1 000 kg	800 kg	1000 kg	850 kg	2 190 kg	1 800 kg
Gross Receipts/ha	R3 875	R3 410	R1 791	R1 434	R878	R746	R23 323	R19 170
Allocated costs/ha	R2 960	R1 350*	R1 377	R964*	R532	R318*	R14 244	R6 003*
Gross Margin/ha	R841	R2 060	R415	R470	R229	R427	R9 078	R 13 166
Labour hours/ha	585	678	114	140	41	66	2 207	2 207

\* Labour costs not included since the model will determine the number of hired workers and will then incorporate the costs of labour hired in the objective function.

### The models

To estimate the livelihoods potential in agriculture, a linear programming model was developed in each of the three farming regions of the Potgietersrus district. This was done by assuming households will have a variety of income sources, including agriculture.

For the purpose of the modelling exercise it was, however, assumed that livelihoods could be created only in agriculture. This assumption was necessary since earlier models which were given the opportunity to allocate household resources among farming activities, migrant labour, local wage employment and informal enterprises, allocated all resources to employment opportunities outside agriculture – a result perhaps of the relative unprofitability of agricultural enterprises in semi-arid environments.

Given the high levels of unemployment and the inability of the labour market to absorb any further employment it would be totally unrealistic to assume unlimited demand for labour. For this reason non-farm activities were excluded from the alternative household activities to enable the model to estimate the livelihood potential of agriculture.

Despite the way the model was built, we acknowledged households would earn income from non-farm and off-farm activities (typically between 20% and 50% of total household income). Currently, many farmers in the Potgietersrus district are involved in a variety of off-farm activities, emphasising the importance of diversifying income earning opportunities in an area where agriculture is a risky business.

The linear programming models were built to estimate a theoretical optimal combination of activities and the number of households that would secure a livelihood through agriculture given the agro-ecological potential of the particular homogeneous farming region. To build these models a number of assumptions had to be made:

- A household consists of seven members, comprising two adult equivalents;
- Households will cultivate only those crops that are well-adjusted to the agro-climatic conditions as listed in Table 5;
- Households can hire labour at R1,30 per hour or have the option of using own labour provided by two adult equivalents which is equal to 1 440 hours per quarter per household;
- Households can obtain production credit at 15%;
- Land values are: arable = R600/ha; grazing = R230/ha; irrigation = R4 500/ha.

The model was asked to maximise the number of livelihoods in each farming region, at the same time ensuring that household agricultural income was equal to the poverty line (R8 800 according to SALDRU figures) plus 10% for each household member. This is more or less equal to an income requirement of R15 000 per annum, which is at least above the wage for unskilled workers of R9 900 per annum. In our view this is the absolute minimum income level necessary for a sustainable livelihood in agriculture. But given the riskiness of agricultural ventures in semi-arid environments a higher income level obtained from agricultural activities is important to ensure a financial cushion in order to cope with crop failures and other misfortunes.

The models for the three regions were specified in the same manner but with different resource constraints and different gross margins. The models were formulated as primal linear programming problems, but a whole range of link equations were also included to link various components of the model.

MAX: Number of households

s.t.

$$\sum_{j=1}^{19} a_{ij}X_j \leq b_i \quad \text{all } i = 1 \text{ to } 10$$

and  $X_j \geq 0 \quad \text{all } j = 1 \text{ to } 19$

Where:

$x_1$ = Sunflower dryland	$x_2$ = Cotton dryland
$x_3$ = Groundnuts dryland	$x_4$ = Sorghum dryland
$x_5$ = Beef cattle (natural grazing)	$x_6$ = Tobacco (irrigation)
$x_7$ = Pumpkins (irrigation)	$x_8$ = Maize (irrigation)
$x_9$ = Cotton (irrigation)	$x_{10}$ = Cabbage (irrigation)
$x_{11}$ = Onions (irrigation)	$x_{12}$ = Wheat (irrigation)
$x_{13}$ = Maize production costs (dryland)	$x_{14}$ = Maize sales
$x_{15}$ = Maize meal sales	$x_{16}$ = Maize meal purchases
$x_{17}$ = Labour hire	$x_{18}$ = Credit
$x_{19}$ = Household	

And:

$b_1$ = Household income target
$b_2$ = Area arable land
$b_3$ = Area irrigated land
$b_4$ = Grazing land
$b_5$ = Labour constraint (family plus hired) Jan - March
$b_6$ = Labour constraint (family plus hired) Apr - June
$b_7$ = Labour constraint (family plus hired) July - Sept
$b_8$ = Labour constraint (family plus hired) Sept - Dec
$b_9$ = Production credit
$b_{10}$ = Irrigation water

## Results

The model as specified was run for each of the three homogeneous farming areas, adjusting the resource constraints and gross margins for local conditions. The results for each of the three runs with the income target per annum at R15 000 per household are summarised in Table 8. The results are fairly realistic and the effect of resource quality and constraints are correctly reflected in the models' farm sizes and the number of livelihoods created.

Table 8: Farm models and estimates of livelihoods created in three homogeneous farming areas of the Potgietersrus district

	Springbokvlakte	Bushveld grazing	Irrigation areas
Farm size :	48 ha	208 ha	9,5 ha
* Arable land	38 ha	18 ha	3,5
* Grazing	10 ha	190 ha	6 ha
Activity mix	Sunflower Groundnuts Cotton 4 beef cattle	Sunflower Sorghum 25 beef cattle	Sunflower Tobacco (irrigation) Onions (irrigation) 2 beef cattle
Household agricultural income	R15 000	R 15 000	R15 000
Capital required to purchase land (per hh)	R28 800	R 47 800	R17 130
- Loan required	R13 800	R 32 840	R 2 130
- Annual payment	R 2 205	R 5 246	R 340
Hired labour (work years)	0	0	1
- Wage	R4 320/work year	R4 320 / work year	R4 320 / work year
Number of households	10 205	4 987	563
Total number of agricultural livelihoods	10 205	4 987	1 126
Current livelihoods	7 735	5 236	1 634
Additional livelihoods created	2 470	(249)	(508)
Total area	536 000 ha	1 056 000 ha	5 508 ha

The estimates presented here could be considered to be the most optimistic figures while the households will still be considered to be fairly poor. As stated earlier we accept households will have other sources of income which could improve the sustainability of the livelihoods. Under these conditions livelihoods would be lost in the Irrigation and Bushveld areas. More livelihoods would be created in the Springbokvlakte, contributing to total net gain of 1 713. However, when the current number of hired work years of 1 549 are taken into account, net livelihoods created through a process of rural restructuring would be only 172. The interesting result of a loss of livelihoods on the irrigation schemes could be the result of the more intensive allocation of household labour to the production process, and less reliance on hired labour.

When higher household income is assumed (to account partly for agricultural risk) the livelihoods created drop considerably. Raising the household income target to R20 000 results in a loss of 1 027 livelihoods:

	Springbokvlakte	Bushveld grazing	Irrigation areas
Total livelihoods	8 776	3 807	995
Additional livelihoods	1 041	(1 429)	(639)

The model's sensitivity to the household income target is further illustrated by the figure below. Note also the increase in hired work years when household income increases. Although the total number of livelihoods declines with an increased income, it stabilises around 7 500 when the income target of the farm households reaches R40 000 a year.

Comparing household income with current wage levels it could be argued that the household income target in the model was set too high. To account for this, a separate run was done with the income target set at R9 000 per annum – closely related to the farm wage and wages for unskilled labour. The net effect of the lower household income target is illustrated below:

	Springbokvlakte	Bushveld grazing	Irrigation areas
Total livelihoods	16 251	8 502	920
Additional livelihoods	8 516	3 266	(714)
Farm size	Arable land : 24 ha Grazing : 6 ha	Arable land : 11 ha Grazing : 111 ha	Arable land : 2 ha Grazing : 3 ha

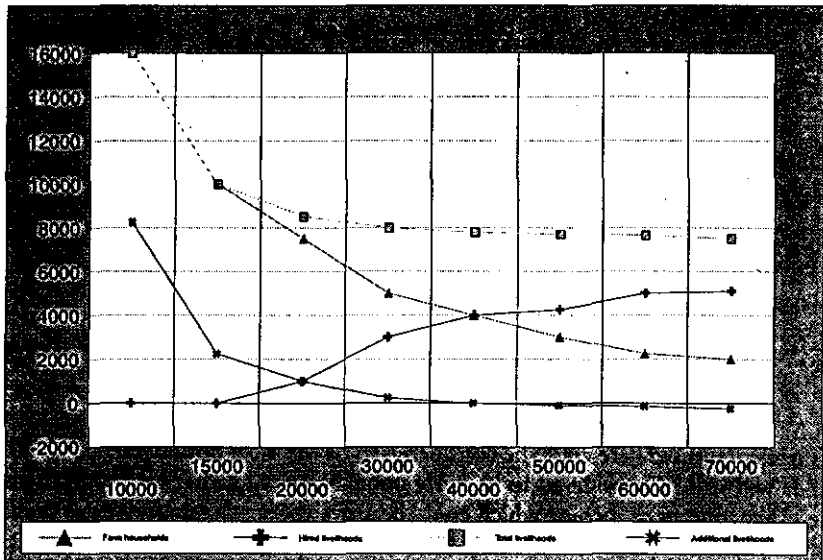


Figure 2: Livelihoods created on the Springbokvlakte at different household income requirements

The results confirm the limited capacity of semi-arid regions to create additional livelihoods through agricultural intensification. According to the results it seems land reform will only benefit or displace current farm workers, and that the majority of potential beneficiaries will still be deprived of a sustainable livelihood in agriculture.



Sustainability of livelihoods

The sustainability of the livelihoods estimated above needs to be assessed in the light of annual financial obligations of households and also in the light of agricultural risk in the region. For the latter purpose use was made of MOTAD procedures (Hazell and Norton 1986) which incorporate risk, that is the probability of the occurrence of drought, to determine the livelihood potential. This was done only for the Springbokvlakte where dryland cultivation is the dominant farming practice but also the most prone to climatic risk.

In the model, crop failure was considered to occur twice in every five years with average to good years having an equal probability in the remaining three years. Running this revised model produced the following results:

Table 9: Estimates of livelihoods created on the Springbokvlakte with risk taken into account

Farm size :	71 ha
* Arable land	57 ha
* Grazing	14 ha
Activity mix	Sunflower Maize (for household consumption) Cotton 4 beef cattle
Household agricultural income	R15 000
Capital required to purchase land (per hh)	R37 420
- Loan required	R22 420
- Annual payment	R 3 677
Total hired labour (work years)	1 898
- Wage	R4 320/work year
Number of households	6 861
Total number of agricultural livelihoods	8 759
Current livelihoods	7 735
Additional livelihoods created	1 024
Total area	536 000 ha

From the results presented here it is clear that the number of livelihoods created by agrarian restructuring on the Springbokvlakte will drop from 10 205 to 8 759 when risk is accounted for. Net additional livelihoods will drop from 2 470 to 1 024.

With each household having to repay loans to buy the land (through the proposed market assisted land reform programme), it was necessary to determine the effect of this debt burden on the financial sustainability of the livelihoods created in agriculture. This is summarised in Table 10.

Table 10: Financial sustainability of livelihoods created

	Springbokvlakte	Bushveld grazing	Irrigation areas
Agricultural income per household	R15 000	R15 000	R15 000
Estimate for income from pensions, informal activities, local wage employment	R3 800	R3 800	R3 800
Financial obligations per annum	R2 205	R5 246	R340
Net household income	R16 595	R13 554	R18 460

The income from non-farm sources could be underestimated. It should, however, be kept in mind that household members are full-time employed in agriculture and the opportunity for allocating household labour to migrant work is therefore limited. There are several periods of slack labour which household members could use to earn income through informal activities and local wage employment. The contribution of these activities to sustainable livelihoods in the Northern Province is discussed next.

## Rural non-farm enterprises as a source of livelihoods

### Introduction

The potential contribution of small enterprises in generating employment and income in rural areas of Africa has become increasingly recognised (Liedholm *et al*, 1994; Tager 1991). Some analysts and policy makers view the development of the non-farm sector as a way to alleviate rural poverty. This view is mainly the result of the success of rural industrialisation in China and the four new industrialised countries in East Asia; the relative failure of previous industrialisation oriented development strategies and the limited labour-absorptive capacity of agricultural intensification strategies (Saith 1993) as was also shown in the calculations above.

There is thus a need to determine the extent to which the development and promotion of small scale rural non-farm enterprises can become a vehicle to promote rural development and to alleviate poverty. It is, however, true that in many countries high participation in these non-farm enterprises often co-exists with a high incidence of rural poverty. Thus, the central policy issue with regard to rural non-farm enterprises is to design policy interventions that will enable these enterprises to fulfil their poverty alleviating function.

The interdependence between agricultural growth and the rural non-farm sector should, however, not be ignored. The existence of strong farm-non-farm linkages highlights the dependence of these enterprises on a healthy and growing agricultural sector.

This section, based on research reported in Kirsten (1995), provides an analysis of the diversity and behaviour of non-farm enterprises in the rural areas of the Northern Province. Sixteen rural villages in the former homeland areas were visited by the author and graduate students during 1995 to record the number and types of enterprises in these villages. A total of 747 businesses was recorded and 70, mainly micro enterprises, mostly part-time, were selected and interviewed. The intention of the survey was to determine the types of non-farm enterprises located in these villages and the employment opportunities they provide.

### Definitions of non-farm activities

Conflicting evidence, controversies and confusion are found in the literature on the rural non-farm sector. Much of this confusion is related to the lack of clear definition and of an analytical framework characterising the nature and place of non-farm enterprises in the economic system.

Mukhopadhyay (1985) identifies two broad prototypes of rural non-farm activities, or two sub-sectors. The first comprises products and/or activities with the following characteristics: The enterprises are mostly run on a more or less stable basis to generate surplus and growth using primarily hired labour. Also evident is a certain degree of technological sophistication. In South Africa these enterprises are typically located in rural towns in 'white' South Africa and also in the decentralisation growth points close to the former homelands. The second sub-sector comprises activities that are often seasonal, which are run with the help primarily of unpaid family labour, using rather primitive technology and catering mostly to the local market.

This broad classification of activities in the rural areas, highlighting the heterogeneity within the sector, could well be used to provide clarity of the nature and role of the sector in development.

Mukhopadhyay (1985) found that the prevalence of activities and enterprises in the second sub-sector is directly linked to landlessness or near-landlessness. These enterprises are typical survivalist micro enterprises and are the majority of enterprises included in this survey. Typically enterprises in the first sub-sector are the more dynamic, have high turnovers and employ a large number of employees. It is also evident that these entrepreneurs own their businesses and their land.

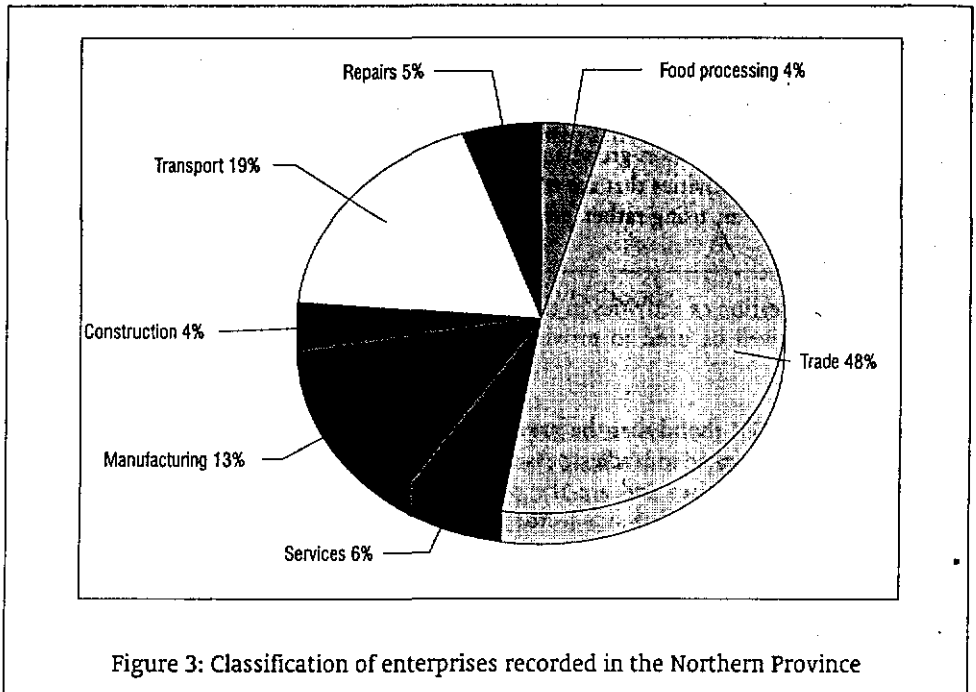
The enterprises or activities discussed in this chapter are located in rural villages in the former homelands in the Northern Province. The entrepreneurs typically do not own land and by definition fall within the second category of enterprises.

A description of the activities of these entrepreneurs is useful in order to get a sense of the nature and composition of the non-farm sector in the former homeland areas. This could also provide an indication of linkages that could exist between the farm and non-farm sectors. Bearing in mind that the majority of the farm households in these areas are subsistence oriented it is expected that these linkages could be very weak.

### A descriptive profile of non-farm enterprises in the Northern Province

A total of 747 enterprises was recorded in 16 villages in the province. Only 70 of these enterprises were interviewed to determine more detailed characteristics such as business size and employment. The survey excluded the major rural towns such as Pietersburg, Thohoyando, etc, as well as the major industrial growth points established under the previous government's decentralisation policy. The majority of these businesses are in any case white-owned and as such would be of little benefit to the survey, although they might be important employers in the region.

The different business types recorded in the 16 villages are summarised in Table 11. From the data in Table 11 (also presented in Figure 3) it can be determined that the majority (47%) of enterprises are commercial and trading enterprises that include general dealers, cafés, spaza shops, bottle stores and butcheries. The second important sector (18%) is transport enterprises, comprising mainly taxi operators and lorry drivers. Around 11% of all recorded enterprises are providing personal and community services. Taken together it is estimated that 76% of enterprises in the selected rural districts are commercial, service or transport enterprises. Thus only a handful of enterprises (around 24%), mainly manufacturing, processing and construction enterprises, are involved in some value adding activities.



To obtain detailed information on the businesses listed in Table 11, 70 enterprises were interviewed to determine the nature of their activities, business size and employment. These enterprises were randomly selected and are classified in economic sectors as follows:

Manufacturing and processing (food preparation)	5 enterprises ( 7%)
Services (including repair activities)	13 enterprises (19%)
Transport (taxis and tractor contractors)	15 enterprises (21%)
Trade (general dealers, cafés, bottle stores)	32 enterprises (46%)
Construction	5 enterprises ( 7%)

Table 11: Number and type of businesses recorded in selected districts

Type of business	Mutale (6)	Maviljan (1)	Masashane (4)	Bakenburg (1)	Total
Building and construction	8	12	4		24
Food processing (baking, beer brewing, milling)	12	2	9	2	25
Services (hair, crèche, day care centre)	12	8	19	2	41
Transport (taxis, contractors)	11	70	33	2	116
Manufacturing (dressmaking, furniture, crafts, metal work, wood work, brick making)	85	3	19	1	108
Trade (hawkers, spaza shops, general dealers, cafés, bottle stores, shebeen, wood)	204	86	91	2	302
Repairs (Radio and TV, shoes, cars, exhausts, radiators)	14	10	4	3	31
<b>TOTAL</b>	<b>346</b>	<b>191</b>	<b>179</b>	<b>12</b>	<b>747</b>

Note: Number of villages surveyed per district is indicated in brackets

### Business size:

The size of businesses in the rural non-farm sector is usually measured in terms of the number of workers employed. From limited empirical evidence Chuta and Liedholm (1990) found that the vast majority of rural non-farm enterprises in developing countries are undertaken by very small micro firms which have fewer than 10 workers. In Sierra Leone, for example, 99% of the firms employ fewer than five workers.

From the analysis presented in Table 12 it is evident that the same trend is to be found in rural South Africa. All the enterprises interviewed in the two provinces are clearly micro enterprises employing fewer than 10 workers. Around 90% of the firms interviewed employ not more than three workers, including a number of self employed entrepreneurs. The one man/woman concerns or owner/operators include beer brewers (single women), taxi owner/operators, the small repair shops for shoes or electronic equipment, and lastly spaza shops.

To get a sense of the extent of the business activity of the enterprises interviewed, Table 13 provides an indication of the monthly turnover of the firms in each of the sectors. Since few of the entrepreneurs keep proper records, the reliability of the information provided can be questioned. It nevertheless provides interesting trends, with the taxi operators and general dealers and bottle store owners showing higher monthly turnovers. The micro nature of many of the enterprises is again confirmed by the information provided in Table 13.

Table 12: Number of workers employed by micro firms in the various sectors

Sector	Number of workers employed		
	Self-employed (0) (Number of firms)	1 – 3 workers (Number of firms)	4 – 7 workers (Number of firms)
Manufacturing	1	2	2
Services	3	12	–
Transport	8	7	–
Trade	2	23	3
Construction	–	3	2

Table 13: Monthly turnover of micro enterprises per sector

Sector	Monthly turnover				
	R200 – R1000 (No of firms)	R1001 – R3000 (No of firms)	R3001 – R6000 (No of firms)	R6001 – R10000 (No of firms)	> R10 000 (No of firms)
Manufacturing	1	–	3	–	–
Services	8	6	3	–	–
Transport	–	3	2	1	4
Trade	3	3	4	3	2
Construction	–	4	–	1	–

### Employment in the non-farm economy

The evidence from a number of surveys in developing countries indicates that non-farm activities provide an important source of primary rural employment in developing countries with between 19% and 28% of the rural labour force employed in non-farm activities (Chuta and Liedholm 1990).

Similar or higher figures can be expected in some of the rural areas of South Africa. From the information obtained from our brief survey of micro enterprises in the two provinces it was, however, possible to determine the relative share only of rural non-farm employment of each of the different sectors identified earlier. This is presented in Figure 4.

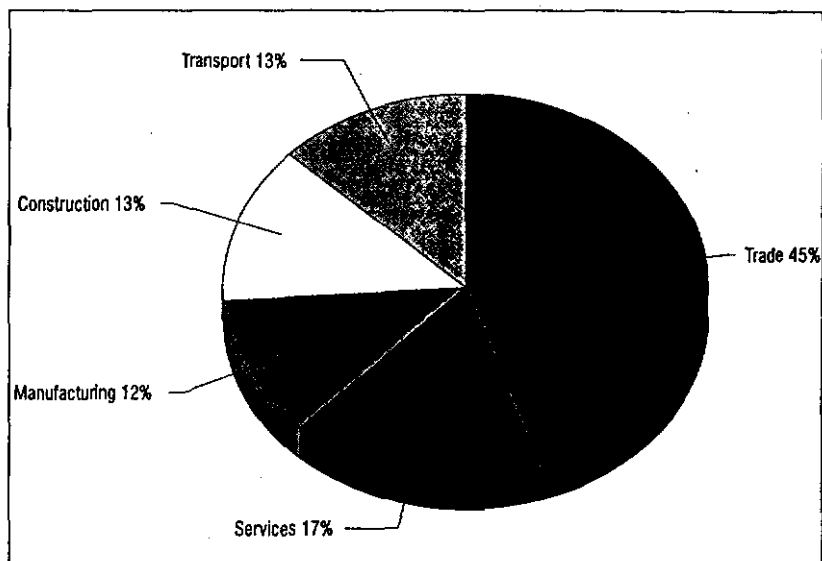


Figure 4: Employment in rural non-farm enterprises per sector (share of total non-farm employment)

As was expected, Figure 4 shows that the shopkeepers employ the largest share (45%) of the work force in the non-farm sector. Thus, despite the micro nature of the individual businesses in the trade sector, it is an important employer in the rural non-farm sector.

Chuta and Liedholm (1979) estimate that the composition of rural non-farm employment typically includes one-third manufacturing and one-third commerce, with services, mining and construction making up the remainder. Our analysis here shows that the shopkeepers employ almost half of the rural non-farm labour force, with manufacturing contributing only 12%. The picture in the rural areas of the Northern Province therefore tends to be somewhat different from other developing countries. The coexistence of a developed and developing economy within one country could partly explain this phenomenon.

Monthly wages paid by the shopkeepers are low – an average monthly wage of R200 was recorded. Full-time workers in the other sub-sectors received similar monthly wages, ranging between R150 and R200.

It was found that in certain sub-sectors of the non-farm economy females dominate, while men are the majority of entrepreneurs and employees in other sub-sectors. Females are dominant in activities such as hair salons, trading stores (as shop assistants), spaza shops, hawking, dressmaking, shebeens. Men, on the other hand dominate in activities such as construction, brick making, metal and woodwork, contract work, taxis and repair services. This section has provided a brief overview of the non-farm enterprises in the rural economy of the Northern Province. This was done in acknowledgement of the limited potential of agriculture to alleviate poverty and improve livelihoods in certain areas of the Northern Province.

Although the evidence provided here is limited and does not tell us much about the potential for rural non-farm enterprises in creating livelihoods, it acknowledges that small scale income earning opportunities outside agriculture are important components of livelihood activities in rural areas, and need to be included in the estimates of potential livelihoods.

Unfortunately it was not possible to calculate the number of livelihoods created through rural non-farm enterprises, and this remains a challenge for future research. These rural enterprises tend to be closely linked to agriculture. Growth of the rural non-farm sector will therefore always be dependent on the performance of the agricultural sector. As a result agriculture has a crucial role to play in rural enterprise employment generation and cannot be neglected.

### *Farm and non-farm linkages*

In the light of the information provided above it is important to take account of the linkages between agriculture and the non-farm sector.

Farming is central to the rural economy, and as such, differences and changes in agriculture will explain much of the variation in rural non-farm activity. On the demand side of the rural non-farm economy, agriculture exerts a large influence, since non-farm enterprises depend primarily on the farm input and consumption demand of agricultural households. Driven largely by agricultural earnings, rural income levels determine the extent of consumer diversification into non-foods. Moreover, land distribution affects income distribution and hence the share of incremental expenditure allocated to rurally supplied, as opposed to imported, non-foods (Haggblade and Hazell 1989). Agriculture also influences the supply side of the rural non-farm economy, primarily through the labour market.

The international literature on agricultural growth linkages gives considerable evidence on the linkages generated by technological change in agriculture and investment projects in agriculture. The theory of agricultural growth linkages (or the 'linkages paradigm') rests on the premise that agricultural growth can lead to substantial indirect growth in non-farm incomes and employment.

These effects arise partly as a result of increases in the use of farm inputs and in processing, marketing, and transport services to handle the larger output. The indirect effects, however, also result from increases in household expenditures on consumer goods and services as a result of increased farm incomes (Hazell and Roëll 1983).

Earlier studies by authors such as Johnston and Kilby (1975), highlighted the importance of production linkages or agriculture's demand links to the non-farm economy. Johnston and Kilby, and Mellor and Johnston (1984), also argue the case for a small farmer development strategy on the basis that it will generate rapid and equitable growth because of more labour-intensive linkages with the rural economy. Johnston and Kilby (1975) point to small farmer demand for fertiliser, construction inputs, equipment and repair services typically provided by small labour-intensive enterprises. Consequently, the indirect effects of agricultural growth have the potential to help alleviate rural underemployment and to contribute to the reduction of rural poverty and malnutrition (Hazell and Roëll 1983).

Apart from the existence of production linkages, Hazell and Roëll (1983) and Mellor (1976) show the importance of consumption linkages in stimulating second-round growth effects.



Strong consumer expenditure linkages between agricultural households, and the non-farm economy and the enterprises discussed earlier, are important, first, because the income and employment generated by these linkages is predominantly concentrated in rural areas; and, second, because the kinds of goods and services demanded are typically produced by small, labour-intensive enterprises (transport, distributive trades, health, and housing and residential construction). Hazell and Roëll (1983) argue that households which spend the largest share of incremental income on goods and services not traded inside the regional economy (non-tradables), would contribute the most to the promotion of labour-intensive growth. These non-tradables typically include locally produced goods and services (often non-foods) consumed entirely within the region.

The magnitude of agricultural growth linkages is usually estimated as regional growth multipliers which measure the amount of extra income generated in a region from stimulating new production of goods and services through the increased consumer and intermediate spending that arises from an initial boost in household income (Delgado and Hopkins, 1994; Delgado *et al* 1994b; Haggblade *et al* 1989).

### The extent and nature of farm and non-farm linkages in sub-Saharan Africa

Haggblade, Hazell and Brown (1989) show the strength of intersectoral linkages in sub-Saharan Africa. In the context of land reform in South Africa the appropriateness of a more detailed discussion of the linkage effects in sub-Saharan Africa is obvious. Of importance are factor market linkages related to capital and labour markets, product market linkages, backwards and forward, as well as consumption demand linkages.

### Factor market linkages

It is generally believed that the capital flow from agriculture is substantial and often more than the reverse flow from non-farm activity to agriculture. The evidence from studies cited by Haggblade *et al* (1989) suggests surpluses have been consistently transferred out of agriculture through fiscal, crop pricing and trade policies. But there is also evidence that surpluses generated from non-farm activities are used to acquire productive agricultural assets, especially land.

The labour market in sub-Saharan Africa is characterised by substantial seasonal labour flows between the rural farm and non-farm sectors. It is estimated that 20% to 40% of the labour force works in both farm and non-farm activities, thus resulting in considerable flows of labour moving back and forth between the rural farm and non-farm sectors.

### Forward and backward production linkages

Agriculture's demand for production inputs is the reason for the existence of backward linkages between agriculture and the manufacturing and trade sectors. Often these inputs are supplied by rural enterprises that are considerably more labour-intensive than their urban counterparts. The type and magnitude of backward linkages vary depending on agricultural technology, size of holding, type of crop and whether production is irrigated or rainfed.

To some extent it also depends on infrastructure and location aspects within the rural economy. The lack of good roads and other infrastructure could influence the location of rural

enterprises, and it could happen that many of the backward linkages do not accrue to the region itself, but to the nearest metropolis or regional centre.

Haggblade *et al* (1989) argue that in general, the backward linkages for agriculture in sub-Saharan Africa appear to be weaker than those measured in Asia. It is in particular Africa's topography and hydrology that severely limit irrigation potential and thereby reduce the demand for inputs, pumps and other irrigation equipment. The current farm technology in Africa is also responsible for the fact that backward linkages appear far smaller than the forward processing linkages from agriculture.

Food processing is by far the most prominent of the forward linkages and virtually all processing activities involve transformation of local agricultural production. After food processing, distribution of agricultural products generates the second largest of the forward linkages from agriculture.

### Consumption linkages

An increase in per capita farm incomes typically leads to increased demand for local services, housing, durables, livestock and horticultural products. Evidence from Asia suggests the production of these commodities and services is labour-intensive, which could thus lead to increased rural employment. Haggblade *et al* (1989) present data that show that African spending patterns support far less rural non-farm activity than do those in Asia.

Marginal budget shares are important predictors of consumption linkages to be anticipated from growing incomes. In African countries, such as Nigeria and Sierra Leone, it has been found that consumers spend only between 11% and 18% of incremental income on rural produced non-foods, while the comparable Asian figures vary between 26% and 31%. According to Haggblade *et al* this difference arises because African consumers spend far more of their average and marginal income on rural produced foods. It appears that transportation networks and proximity to rural towns contribute to the much higher Asian incremental consumption on rural produced goods and services.

The evidence cited by Haggblade suggests that lower farm-non-farm linkages in Africa are largely due to the high share of non-marketed goods and services in total consumption. Because they are not marketed, many rural African goods and services are not measured and if values for consumption of home produced goods are not imputed, it is highly likely that farm-non-farm linkages can be underestimated.

A study by Delgado *et al* (1994a) confirms that these consumption linkages cannot be ignored and that they are often underestimated and considerably stronger than suggested by the earlier studies. They found that the share of growth linkages attributable to consumption alone vary between 42% in Senegal; 93% in Burkina Faso, and 98% in Zambia.

A study by King and Byerlee (1978) in Sierra Leone found enough evidence to support the hypothesis that low income households consume goods and services which require less capital and foreign exchange and more labour than do the goods embodied in the consumption patterns of higher income households.

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## Some estimates of consumption linkages

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From the literature on agriculture's linkage effects, within the context of land reform, it can be said that agriculture is the key sector in the rural economy, and usually has strong backward (production) and forward (production and consumption) linkages with the non-farm sectors.

Backward linkages are generally the least important of the different linkage effects. Higher input use in more intensive agriculture associated with modern biological technology produces stronger linkages than traditional less intensive practices. The effect of mechanisation on these linkages is inconclusive, and can strengthen or weaken them. The type and magnitude of backward linkages vary depending on agricultural technology, farm size, crop and agricultural potential (land quality, climate and water availability).

In large scale agriculture, food processing is the most prominent of the forward linkages, while consumption linkages are small. On the other hand, in small scale agriculture, consumption linkages are far more important than the production linkages due to expenditure patterns of smallholders who generally support the local economy. Total forward linkages (production and consumption) are stronger in small scale agriculture.

Consumption linkages and in particular the marginal budget shares for non-tradable goods drive the estimates of agricultural growth multipliers (Haggblade, Hammer and Hazell 1991). Acknowledging the importance of consumption linkages, we provide in Table 14 a summary of the average budget shares and expenditure elasticities for selected commodities obtained from studies done in rural South Africa. Given the relationship between expenditure elasticity ( $\xi$ ), marginal budget share (MBS) and average budget share (ABS), as identified by Hazell and Roëll (1983) ( $\xi = \text{MBS} / \text{ABS}$ ), we were also able to estimate the marginal budget shares, which provide a good indication of consumption demand linkages.

Marginal budget shares indicate how increments to income will be spent. Growth multipliers, which measure the effect of an increase of income on growth in other sectors in the economy, depend overwhelmingly on the marginal budget shares. It is, however, true that increased expenditure in demand constrained items (non-tradables) bring about a greater growth impact. Therefore we need to have a classification between tradable and non-tradable commodities to be able to calculate the growth multipliers from the marginal budget shares. The information provided in Table 14 nevertheless provides us with some idea of the extent of these linkages, which are important in assessing agriculture's contribution to creation of livelihoods in other sectors of the rural economy.

It is argued that growth that benefits only a small number of large farmers does not have large rural consumption linkages for locally produced goods and services, the production of which would provide a great deal of local employment. On the other hand, growth that stimulates the incomes of large numbers of small farmers is likely to lead to widespread increase in demand for local consumer goods and services.

Large scale farms generate smaller multipliers due to their more urbanised household expenditure patterns with low marginal budget shares for rural non-tradables. Only if their expenditure patterns approach those of smaller farms do they generate larger multipliers.

These findings provide a strong argument for a land reform programme in South Africa. The creation of smaller farms with more people getting access to agricultural income will strengthen consumption linkages, which will be beneficial for rural economic growth. In addition, the choice of technology on these smaller farms, given the crushing rural poverty and unemployment, should favour labour-use.

Policy should also explicitly consider strengthening the farm and non-farm linkages, since this will provide a strong impetus for rural growth, employment creation and poverty alleviation. In this respect, it is important that a land reform programme spans more widely than the redistribution of agricultural land.

Not everyone will benefit directly from land redistribution. Since the landless and the near-landless households depend on non-farm earnings, support of rural non-farm enterprises should therefore also feature high on the agenda to ensure additional rural livelihoods.

TABLE 14: A comparison of marginal budget shares and elasticity estimates for rural households in South Africa

Expenditure Item	Venda (Dankwa <i>et al</i> 1992)			Lebowa (Dankwa <i>et al</i> 1992)			Venda (Van Zyl and Vink 1992)		
	ABS#	Elasticity**	MBS***	ABS	Elasticity**	MBS	ABS	Elasticity*	MBS
Staple food	-	0,91		2,9%	-0,24	-0,69%	4,5%	0,414	1,86%
Other food	17,3%	0,80	13,84%	15,3%	0,88	13,46%	19,6%	0,956	18,73%
Household expenditure	-	1,14		6,3%	1,14	7,18%	7,1%	0,967	6,86%
Transport	4,9%	1,66	8,13%	4,4%	0,79	3,47%	3,6%	1,039	3,74%
Clothing	17,2%	1,15	19,78%	12,2%	0,84	10,25%	15,9%	1,266	20,13%
Savings	16,8%	0,92	15,50%	21,8%	2,14	46,65%	11,5%	0,894	10,28%
Durables	4,2%	0,64	2,69%	18,3%	2,32	42,45%	10,9%	1,078	11,75%
Farm expenses	-	0,94		12,2%	0,75	9,15%	14,3%	0,935	13,37%
Education	15,3%	1,34	20,5%	6,6%	0,89	5,87%	12,5%	1,061	13,26%

Notes : # Average Budget Share  
 \* Income elasticity  
 \*\* Expenditure elasticity  
 \*\*\* Marginal Budget Share

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## Conclusion

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The perception that agriculture in semi-arid areas has limited potential to create additional livelihoods through more labour-intensive practices was confirmed by the results of this research.

A linear programming model was used to estimate the livelihood potential in the different agro-climatic regions of the Potgietersrus district. According to the results of the models it was estimated that only 172 additional livelihoods would be created through a reform process. These were optimistic results with households earning an agricultural income of only R15 000 without accommodating any risk factor. When risk was incorporated in the modelling exercise the number of livelihoods created dropped. To make provision for the risky agricultural conditions the household income target was increased to R20 000 per household per annum. This resulted in a loss of 1 027 livelihoods in the Potgietersrus district.

Acknowledging that rural households will earn income from other sources the second part of the chapter paid attention to the important contribution of rural non-farm enterprises. A lack of diversity in the rural non-farm economy and a virtual absence of small scale rural industries and other value-adding activities were found. Nevertheless these enterprises could provide a source of livelihood for many rural households, independently or in combination with agricultural activities.

We have also briefly shown that demand for the commodities of these enterprises will be stimulated by a growth in agricultural income. It is therefore important not to neglect agriculture despite its limited capacity in semi-arid environments to support a large number of households.

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