

## **SMALL-SCALE FARMING AND EXTENSION IN SOUTH AFRICA'S NORTHERN PROVINCE**

B. Hedden-Dunkhorst<sup>1</sup> and N.M. Mollel<sup>2</sup>

### **ABSTRACT**

*Small-scale agriculture in South Africa's Northern Province varies significantly. Farmers have different objectives, they face different environments, and are involved in various farm enterprises. This situation issues challenges to institutions which offer support services to smallholders, particularly the extension service. The paper provides an entry point to discuss extension for small scale farmers in the Northern Province by (1) offering a descriptive analysis of small scale farming system and (2) by trying to quantify the impact of support services on farmer's performance using statistical analyses. The results show that credit and grants seem to contribute to agricultural performance in some areas, while no significant coefficients could be estimated for extension. The latter finding corresponds with a more qualitative assessment of government extension by other authors. However, in the Northern Province new approaches to smallholder extension are currently developed, tested and implemented. With their focus on improving the relevance of extension advice through farmer's participation and staff training, these approaches could contribute to a significant improvement of the impact of extension. Yet, the introduction of an appropriate monitoring and evaluation component to assure impact assessment and the necessary adaptation of the new system is strongly recommended.*

### **1. INTRODUCTION**

The potential of smallholder agriculture to create employment in rural areas, generate income, and contribute to food security has been proven in many developing countries. This is recognised by the new South African Government and reflected in the new Agricultural Policy (Ministry of Agriculture and Land Affairs, 1998).

To promote development in small-scale agriculture support services are restructured, and new programs and projects are implemented. Agricultural research, extension and finance institutions are today to a much larger extent targeting small-scale farmers. Extension in particular plays an important role to communicate information from research institutes and policy makers to farmers, and visa versa. Extension agents can facilitate joint action among farmers (e.g. in input supply, marketing, sharing of equipment and labour). Unfortunately,

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<sup>1</sup> Visiting Senior Lecturer, Department of Agricultural Economics, University of the North.

<sup>2</sup> Professor, Department of Agricultural Extension, University of the North.

unfavourable structures and lack of financial resources, skills and motivation of personnel often limit the impact of agricultural extension on development.

Referring to South Africa's Northern Province, this paper aims to shed some light on the situation of small-scale agriculture and support services. It first offers a description of the characteristics of smallholder farming in different areas of the Province. This provides a basis for evaluating farmer's support needs. Secondly, it attempts to estimate the impact of support services on farmer's performance. Thirdly, based on a literature review, extension support to smallholder farmers is analysed. Fourthly, new developments in extension as presently offered by the Northern Province Department of Agriculture, Land and Environment are discussed. Finally, the paper offers suggestions for further improvements of the extension service to small-scale farmers in the Province.

## **2. SMALLHOLDER FARMING IN THE NORTHERN PROVINCE**

In South Africa's Northern Province 88 percent of the population of 5.1 million people live in rural areas (Development Bank Southern Africa 1995). More than ninety percent of rural households are involved in agricultural activities (University of the North, Department of Agricultural Economics 1996, and Statistics South Africa 1999). These often include both, crop and livestock production. Most typically, however, South African smallholder farming systems are characterised by a large off-farm income component (Table 1). On average farming activities account for about 10 percent of household's income. Despite this situation, agriculture fulfils numerous important functions, including food security and risk insurance. Besides, agriculture has a potential to further contribute to income and employment generation. Although rural households often pursue similar objectives, smallholder agriculture varies across and within different areas in the Province. Recognition of this variability is important in the process of technology development, transmission, and adoption.

In an attempt to identify characteristics of small-scale agriculture in the Northern Province and also to capture variability the Department of Agricultural Economics, University of the North conducted a baseline survey in late 1996. The survey was carried out in three study areas, each representing a different agro-ecological zone. The zones were classified on the basis of average annual rainfall. The areas sampled were located in Bochum, Sekhukhuneland and Sekgosese District<sup>3</sup>. One hundred farm-households were interviewed in a total of four

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<sup>3</sup> *Average annual rainfall in the three study areas is as follows: Bochum District about 300 mm, Sekhukhuneland about 400 mm, and Sekgosese 620 mm (National Department of Environment and Tourism: National Weather Bureau, 1997). The study areas in Bochum District are situated approximately 90 km north-west of Pietersburg, Sekhukhuneland and Sekgosese are located 80 km south-east and 100 km north-east of Pietersburg respectively.*

villages in each of the areas. The total sample included 300 households.

## 2.1 Farm-household characteristic: Facts and conclusions

### 2.1.1 Facts

Farm-household characteristics and information on crop and livestock production are summarised by study area in Table 1 and Table 2. In terms of crop production, as expected, less involvement can be observed in the low rainfall area (Bochum) despite more arable land per household (on average 4.5 ha versus 1.1 ha in Sekgosese). The average value of crop production for crop farmers in Bochum is much lower compared to the average value of crop production in the other areas. Only six percent of farmers in Bochum sell crop products, and the average revenue is negligible (R21 in 1996). In Sekhukhuneland and Sekgosese again few sample farmers are marketing crop products (six and ten percent, respectively), however, average revenues are much higher (R269 in Sekhukhuneland and R456 in Sekgosese). This suggests a higher potential for market-orientation particularly in Sekgosese.

**Table 1: Characteristics of smallholder households in three selected areas in the Northern Province**

Resource Endowment (in 1996)	Bochum <sup>1</sup>	Sekhukhune <sup>2</sup>	Sekgosese <sup>3</sup>
	n = 100	n = 100	n = 100
Households involved in farming (crops and/or livestock) (%)	88	92	96
Households involved in mixed farming (crop and livestock) (%)	54	59	63
Households involved in cropping only (%)	10	18	27
Households involved in livestock production only (%)	24	15	6
Full-time, adult equivalent household members available for farming (no.) for households involved in farming	1.61 (1.19)	2.25 (1.46)	2.03 (0.99)
Households with arable land (% of all sample households)	90	85	90
Average arable land (ha) for households with arable land	4.47 (3.55)	2.20 (1.33)	1.08 (1.09)

<b>Farm-Household Characteristics (for households involved in farming, in 1996)</b>	<b>n = 88</b>	<b>n = 92</b>	<b>n = 96</b>
Average value of crop and livestock production in 1996 (Rand) <sup>4</sup>	319 (517)	735 (1122)	910 (1388)
Average monthly off-farm income (Rand)	705 (870)	589 (377)	654 (421)
Average revenues from crop and livestock production (Rand)	167 (641)	252 (1225)	336 (1251)
Average unemployment rate (adults in working age/unemployed in working age)	0.53 (0.21)	0.54 (0.23)	0.56 (0.23)
Female headed households (%)	46.6	46.7	41.7
Households attending meetings held by extension agents (%)	28.4	53.3	30.2
Households being members of farmer's organizations (%)	13.6	0	4.2
Households received credit for farming in 1996 (%)	10.2	20.1	16.7
Households received grants for farming in 1996 (%)	20.5	7.6	19.8
Households perceiving access to arable land as sufficient (%)	76.2	57.1	36.9

<sup>1</sup> The study areas in Bochum District are located about 90 km north-west of Pietersburg, average annual rainfall amounts to about 300 mm.

<sup>2</sup> The study areas in Sekhukhuneland District are located about 80 km south-east of Pietersburg, average annual rainfall amounts to about 400 mm.

<sup>3</sup> The study areas in Sekgosesse District are located about 100 km north-east of Pietersburg, average annual rainfall amounts to about 620 mm.

<sup>4</sup> The value accounts for the value of livestock sold and consumed by the household, based on local prices.

Figures in parenthesis = standard deviations.

**Source:** UNIN, Department of Agricultural Economics, Northern Province Household Survey, 1996.

**Table 2: Characteristics of crop and livestock production in three selected areas in the Northern Province**

<b>Crop Production (in 1996, for households involved in crop production)</b>	<b>Bochum</b>	<b>Sekhukhune</b>	<b>Sekgosese</b>
	<b>n = 64</b>	<b>n = 77</b>	<b>n = 90</b>
Households involved in crop production (%)	64	77	90
Average value of crop production (Rand)	192 (318)	585 (1040)	782 (1293)
Households selling crop products (%)	6.3	6.5	10.0
Average revenue from crop production for households selling crop products (Rand)	21 (5)	269 (282)	456 (406)
Grain crops (listed according to importance in the area)	Maize, Sorg.	Mill., Sorg., Maize	Maize, (Sorg.)
Other major crops (listed according to importance in the area)	Beans, Cowpea	Beans, Cowpea	Grdn., Cowp.
Households using fertilizer (%)	21.9	3.9	34.4
Average quantity of fertilizer used (kg) by household applying fertilizer	47 (68)	92 (95)	37 (63)
Average crop diversity (number of crops grown)	3.0 (1.2)	2.7 (1.4)	2.8 (1.6)
Households using improved seeds (%)	48.4	5.2	52.2
Households carrying out the following improvement practices: fallow, tillage, manure application	21.9	32.5	37.8
<b>Livestock Production (in 1996, for households involved in Livestock Production)</b>	<b>n = 78</b>	<b>n = 74</b>	<b>n = 69</b>
Average value of livestock sold and consumed (Rand)	389 (788)	600 (1419)	656 (1621)
Households selling livestock products (%)	20.5	16.2	18.8
Average revenue from livestock production for households selling livestock products (Rand)	187 (679)	295 (1357)	409 (1413)
Households owning cattle (%)	30.2	28.7	35.4

<b>Livestock production (in 1996, for households involved in livestock production)</b>	<b>Bochum</b>	<b>Sekhukhune</b>	<b>Sekgosese</b>
Average number (no.) of cattle owned by households owning cattle	6.3 (5.2)	5.2 (3.7)	10.9 (9.5)
Households owning donkeys (%)	5.2	9.6	0
Average number (no.) of donkeys owned by households owning donkeys	4.0 (1.9)	6.2 (3.3)	0
Households owning goats (%)	62.5	72.3	29.2
Average number (no.) of goats owned by households owning goats	9.3 (6.7)	9.3 (7.6)	5.0 (3.7)
Households owning sheep (%)	6.2	6.4	2.1
Average number (no.) of sheep owned by households owning sheep	14.8 (13.5)	7.2 (2.8)	7.5 (3.5)
Households owning chickens (%)	30.2	23.4	34.4
Average number (no.) of chickens owned by households owning chicken	7.4 (5.5)	5.8 (4.9)	8.6 (8.0)
Average expenditures (Rand) inputs for livestock production (feed, treatment, fees)	54 (366)	7 (22)	4 (16)

Figures in parenthesis = standard deviations;

**Source:** UNIN, Department of Agricultural Economics, Northern Province Household Survey, 1996

Despite the dry conditions in Bochum, maize is the dominant grain crop. This is different in Sekhukhuneland where primarily drought resistant crops, millet and sorghum, are planted. Where maize is dominating (Bochum and Sekgosese) more farmers apply fertiliser and use improved seeds. On the other hand, more farmers in Sekhukhuneland compared to Bochum carry out soil improving practices, like following, tillage, and manure application (33 percent of farmers in Sekhukhuneland versus 22 percent in Bochum). In Sekgosese crop production is clearly more intensive, in terms of both, improvement practices and the utilisation of purchased inputs. This is also reflected in the higher average value of crop production, and the fact that slightly more farmers are involved in commercial production.

In terms of animal production the situation looks different than expected. More

farmers in Bochum compared to Sekhukhuneland and Sekgosesese are involved in livestock husbandry. But, the average value of livestock sold and consumed is lowest in Bochum. This corresponds with the finding that, although the percentage of farmers selling livestock is slightly higher in Bochum, the average revenue per farmer is lowest. In addition, it is interesting to note that more households in Sekgosesese compared to Bochum keep cattle (35 versus 30 percent) and the average number of cattle kept is much higher in Sekgosesese (eleven versus six animals). This is particularly surprising when considering the problem of land scarcity in Sekgosesese<sup>4</sup>. On the other hand, goats are much more important in Bochum and particularly in Sekhukhuneland compared to Sekgosesese. This is true in terms of both, percentage of farmers involved in goat husbandry and average number of goats kept per goat owner. Goats generally require less labour inputs than cattle, particularly for herding. The finding of more cattle than goats kept in Sekgosesese might be related to the fact that more household members are available for farming activities in Sekgosesese compared to Bochum (2.0 versus 1.6 household members); a fact which is also reflected in the higher unemployment rate in Sekgosesese compared to Bochum (0.56 versus 0.53).

Looking at the smallholder farming system per se, the following can be noted: subsistence production is the major objective of small scale farming in the Northern Province. Yet, there seems to be a potential for surplus production in areas with a higher agricultural potential. The average value of crop and livestock production per household involved in farming increases with increasing rainfall in the area. But, lower farm incomes are offset by higher off-farm incomes. Average monthly off-farm income equals to R 705 in Bochum versus R 589 in Sekhukhuneland and R 654 in Sekgosesese. Off-farm income derives primarily from salaries, pensions and remittances. A reason for higher off-farm incomes in Bochum might be the fact that this area is best connected to Pietersburg, the major urban centre in the Province.

### **2.1.2 Conclusions**

When considering study areas individually, the following picture arises. Farming in Bochum is almost exclusively meant to supplement household food requirement. Maize is the most important staple food and the most important crop planted. Despite unfavourable climatic conditions for maize, farmers seem to be in the position to take the risk of crop failure and offset these by food purchases. The data suggest that livestock production has a higher potential than

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<sup>4</sup> *In Sekgosesese not only arable land, but also grazing is extremely limited. Also, a larger percentage of farmers consider the size of land available as insufficient (Table 1).*

crop production in Bochum. Thus, development efforts would seem to be most effective in the area of livestock production. Whether possibly grazing schemes could have a positive impact on increased livestock productivity would need to be investigated.

The situation in Sekhukhuneland is quite different. Although it is a mining area, off-farm income is lowest among the study areas. This might explain why farmers, despite more favourable conditions in terms of rainfall in Sekhukhuneland compared to Bochum, concentrate on drought resistant, low input crops (millet and sorghum). Where the potential to offset crop failure through off-farm income is limited, risk aversion becomes more important. In terms of livestock production, farmers in Sekhukhuneland concentrate on goats, mainly for home consumption. Goats with their high reproduction rate and low investment needs are much more suitable to satisfy immediate food needs compared to cattle. These findings suggest that food insecurity could be a major concern in the area.

Sekgosese provides an example for an area with a higher agricultural potential. Yet, most farmers are producing for subsistence. Because of limited local demand producer prices for crop products are much lower in Sekgosese compared to other study areas. But, high transaction costs limit the exportation of agricultural products out of the area. Constraints to market agricultural products were mentioned as limitations for production increases. Solving marketing problems, e.g. through organising farmers and improved access to credit could possibly increase productivity in areas with higher agricultural potential.

In summary, the findings reflect a large variety of agricultural activities and problem areas. This has implications on both farmer's needs for support services and requirements in terms of human and capital resources to successfully provide support.

### **3. AGRICULTURAL SUPPORT SERVICES FOR SMALL SCALE PRODUCERS**

This section focuses on agricultural support services, and attempts to answer the following questions. To what extent do small-scale farmers have access to support services? Is it possible to measure an impact of agricultural support services on smallholder's performance? Which investment provides best returns (e.g. extension, credit)?

Although the focus of this paper is on extension, it also looks at means of support

through farmer organisations, credit, and grants. Farmers' organisations' access to credit for farming and grants for agricultural inputs are often initiated or provided through extension personnel.

Descriptive statistics on the access to or utilisation of support services by sample farmers are given in Table 1. Besides, through correlation and regression analysis the relation between and the impact of various support institutions on the performance of small-scale farmers is estimated.

In the 1995/96 cropping season relatively high proportions of farmers have attended one or more meetings offered by an extension officers. The percentage of farmers attending meetings range from 28 to 53 percent across the study areas. This indicates a high coverage. Farmer organisations, on the other hand, do not seem to be very common in the Northern Province. Only in Bochum 14 percent of farmers are members of farmer organisations. Though, a moderate correlation between "attending meetings held by extension officers" and "membership in farmer organisations" suggests an involvement of extension officers in farmer organisations (Table 3). Credit and grants to purchase farming inputs are provided partly by the government through extension officers and partly by other organisations. The proportion of farmers making use of or receiving credit or grants (primarily drought relief from Government) is again relative high (ranging from 29 to 36 percent across the study areas). Though, no significant correlation between participation in meetings held by extension officers and the receipt of credit or grants can be observed.

**Table 3: Indicative correlation coefficients for selected variables (n=100 for each study area)**

Variables	Bochum			Sekhu- khune	Sekgosese		
	vlive	org	Credit	credit	vlive	org	Grant
value of crops produced (vcrop)	-	-	0.24	0.65	0.21	-	0.68
value of livestock (vlive)	-	-	-	-	-	-	-
extension received (exten)	-	0.48	-	-	-	0.20	-
member in organisation (org)	0.29	-	-	-	-	-	-

Correlation coefficients labelled with "-" are less than 0.20 or 1.00.

**Source:** UNIN, Department of Agricultural Economics, Northern Province Household Survey, 1996.

To estimate the impact of support services on the performance of small scale agriculture two regression models were estimated for each of the study areas. The performance of small-scale agriculture was defined as the value of crops produced in a first model and the value of livestock produced in a second model.

Ordinary least squares regression results showed that the models considering the value of livestock production were not significant in any of the study areas. This would suggest that extension, farmers organisations, credit and grants have no impact on the value of livestock produced. Significant results were received for Sekhukhuneland and Sekgosese for the models testing the impact of independent variables on the value of crops (Table 4). Both models suggest no impact of extension and farmer's organisations on the value of crops produced, but a positive impact of credit in Sekhukhuneland and grants in Sekgosese.

**Table 4: Production regression results**

Variables	Sekhukhune (n = 92)	Sekgosese (n = 96)
value of crops produced	Dependent	Dependent
extension received	138.58 (0.87)	- 39.76 (-0.18)
member in organization	NA	-25.27 (-0.05)
credit received	7.74 (8.20) <sup>***</sup>	1.09 (1.18)
grant received	0.92 (1.29)	10.45 (8.92) <sup>***</sup>
adjusted R <sup>2</sup>	0.42	0.45

t-statistics in parentheses, \*\*\* significant at 0.5 % probability level

**Source:** UNIN, Department of Agricultural Economics, Northern Province Household Survey, 1996

The evidence of these results is limited. Further studies are necessary to verify them. More questions need to be asked and answered. Nevertheless, the following conclusions could be drawn: First, a relative good coverage of the information provided by extension agents does not have a significant impact. This could be due to lack of appropriate technologies offered to small-scale farmers and/or inappropriate methods of communicating extension contents. Secondly, the results further suggest that the potential of farmer's organisations is not utilised sufficiently in the Northern Province. Extension can play an important role in facilitating the establishment of farmer's organisation on the grass root level. Thirdly, the finding related to the impact of credit or grants on crop production suggests that cash constraints limit agricultural productivity.

#### **4. AGRICULTURAL EXTENSION FOR SMALL SCALE FARMERS IN SOUTH AFRICA**

In order to contextualise the above survey findings and to capture the dimensions of agricultural extension to small-scale farmers from another angle a broader view is now considered.

In the past agricultural extension in South Africa has been criticised for not doing enough, not doing it well and for not being relevant (Rivera, 1991). Much of this weakness, it is alleged, is due to lack of a clear and justifiable mission and development policy that provides guidelines as to the nature, purpose and direction for extension (Bembridge, 1988 and Düvel, 1998).

While these allegations may hold water it is also true that the problems of extension services in South Africa are historical. In the apartheid era white commercial farmers were provided with excellent extension and other support services while black farmers in the homelands were deprived of the same. White extension officers, trained in well equipped training institutions suitable for providing practical training relevant to the needs of the commercial sector, served the white commercial farmers, while black extension agents trained in poorly equipped training institutions served black small scale farmers.

Farmer's organisations play a significant role in supporting agricultural development. For the South African Farmers Union a good foundation was built to provide quality service to the commercial farming sector through financial support from the previous government. The National African Farmers Union (NAFU) on the other hand could not provide the much needed support to subsistence and emerging farmers because of a weak financial base.

With respect to agricultural extension, this situation has not changed significantly. Kraft (1997) asserts that failures of extension services are attributed to bureaucratic inefficiencies and poor formulation and implementation of extension programs. A review of extension services in a number of countries including South Africa by Umali and Schwartz (1994) found that the problems of extension systems are due to

- poor client orientation,
- inadequate human resource capacity,
- weak government commitment to programs and lack of sustainability.

In his evaluation of extension services in the former Republic of Venda

Bembridge (1988) enumerated the following critical problems:

- lack of operational agricultural development policy, leading to lack of clear objectives in planning extension programs,
- poor management of services within departments,
- poor linkages with research institutions and lack of adequately trained research staff,
- extension officers dissatisfaction with salaries, housing, transport, general working conditions and training, and
- lack of credit facilities.

These issues focus on two major areas: the need to design and implement extension programs based on development policies, and the structure and performance of the extension service.

Many suggestions have been made to come out of the present predicament. Introducing participatory approaches is seen as a way to increase coverage and obtain commitment from the farmers and making extension programs more relevant (Düvel 1998). Other more strict measures such as privatisation have been suggested. Such an approach, however, is likely to marginalise the small-scale farmers.

Sebidi (1997) has suggested adjustments to be made in the extension system on the following aspects:

- approach to program targeting,
- organisational structure,
- extension methods and approaches,
- content of extension advice,
- training of extension workers, and
- attitudes towards farmers existing knowledge and practices.

Though extremely valid, these suggestions have implications in terms of limited resources (finances, time and skills). In order to note what has been achieved in the past years, the following section aims to summarise major new approaches to agricultural extension for small-scale farmers in the Northern Province Department of Agriculture, Land and Environment.

## **5. NEW DEVELOPMENTS IN AGRICULTURAL EXTENSION IN SOUTH AFRICA'S NORTHERN PROVINCE**

In the past years government extension in South Africa's Northern Province has tried to improve its relevance for smallholder agriculture. However, the need to integrate the four services of the formerly self-governed territories now located in the Northern Province, into a single structure still remains a challenge. Another predicament is related to the development policy of the former government. Support concentrated to a large extent on irrigation and dryland projects, where services were subsidised and management externalised. These projects do not only pose a huge financial burden to the Department of Agriculture, Land and Environment, but they also require substantial efforts to restructure them.

Nevertheless, new extension approaches are tested by the Department and implemented in selected pilot areas. One of the new approaches is related to the need to identify appropriate technologies for small-scale farmers. It involves on-farm trials for a number of technologies (e.g. maize varieties, pest control, soil and water conservation, draft animals, vegetable production). These technologies have been identified and prioritised by farmers. Teams consisting of farmers, extensionists and researchers are involved in the trials. Qualitative and quantitative data are collected and evaluated during and after the trials. Villagers are exposed to the trials and can evaluate the results by themselves. Presently six teams, each consisting of about four members, are operating (Ficarelli, 1999 and Zwane, 1999).

Another approach addresses the training needs of extension officers. About ten percent of the 560 extension officers in the Province have been trained on participatory extension methodologies. More training is planned. In terms participatory extension methodologies close co-operation has been developed with partners from Zimbabwe (University of Zimbabwe, Intermediate Technology Zimbabwe, and the Governmental Extension Service (AGRITEX)) (Ficarelli, 1999 and Zwane, 1999).

In general the extension concept of the provincial government moves away from a commodity based approach to a more holistic approach of solving a problem. The idea is to assist primarily small scale farmers to use their limited resources most efficiently either for income generation through market oriented production, or as a means to produce food for home consumption.

## **6. SUMMARY AND CONCLUSIONS**

The paper starts off with a description of the smallholder farming system in the Northern Province based on a survey carried out in 1996. Problems related to food insecurity, drought mitigation, access to markets, crop and livestock productivity are identified. These indicate the wide range of intervention areas for support services. Secondly, an attempt was made to quantify the relation between farmer's access to or utilisation of support services and their agricultural performance. In terms of extension the results suggest limited impact on agricultural performance, although 30 to 40 percent of the randomly sampled households attended meetings held by extension officers. These findings comply with assessments on the impact of government extension by other authors (section 4).

Since 1996 the Northern Province Department of Agriculture, Land and Environment is in a process to identify and address critical issues related to extension for small scale farmers. With external assistance, through the German Technical Co-operation (GTZ) in particular, and a project on management support funded by DfID (Department for International Development), new approaches have been developed and are implemented. These approaches address aspects related to (1) the identification and development of appropriate technologies through farmer participation and (2) staff training concentrating on participatory methodologies. While these activities need to continue and be internalised into the system, it is important to add another component which enables the assessment of staff performance and the monitoring and evaluation (M&E) of the improved system. Developing an appropriate M&E systems could help to shape the extension service at an early stage of transformation. In this context statistical analyses, as used earlier in this paper to estimate the performance of support services, could be applied, but is obviously not sufficient.

## **REFERENCE**

BEMBRIDGE, T.J., 1988. *An evaluation of the Venda Agricultural Extension Service*. Department of Agriculture and Forestry, Republic of Venda.

DEVELOPMENT BANK OF SOUTHERN AFRICA, 1995. *Northern Province statistical macroeconomic review*. DBSA, Halfway House

DÜVEL, G.H., 1997. Institutional changes for meeting extension challenges in agricultural development in South Africa. In: *Extension strategies for agricultural*

*and rural development in Africa*. Proceedings of 31st Conference of South African Society of Agricultural Extension: 2-14.

FICARELLI, P.P., 1999. *German technical co-operation, broadening agricultural services and extension delivery*. Northern Province Department of Agriculture, Land and Environment. Personal communication.

KRAFT, N.J., 1997. Public or private extension: Who pays and who provides? In: *Extension strategies for agricultural and rural development in Africa*. Proceedings of 31st Conference of South African Society of Agricultural Extension: 29-42.

MINISTRY OF AGRICULTURE AND LAND AFFAIRS, 1998. *Agricultural policy in South Africa*. A discussion document. National Department of Agriculture, Pretoria.

NATIONAL DEPARTMENT OF ENVIRONMENT AND TOURISM: NATIONAL WEATHER BUREAU. 1997. *Rainfall data, 1980-1997*. Pretoria.

NORTHERN PROVINCE CENTRAL STATISTICAL SERVICE, 1995. *Provincial statistics 1995 Northern Province*. CSS report No 00-90-09 (1995). CSS, Pietersburg.

RIVERA, W.M., 1991. Agricultural extension world-wide, a critical turning point. In: Rivera W.D. and Gustafson D.J. (eds) *Agricultural extension world-wide: Institutional evolution and forces for change*. Elsevier, London.

SEBIDI, 1997. Sustainable extension. In: *Extension strategies for agricultural and rural development in Africa*. Proceedings of 31<sup>st</sup> Conference of South African Society of Agricultural Extension: 112-116.

STATISTICS SOUTH AFRICA. 1999. *Rural survey, 1997*. Statistical release P0360. Statistics South Africa, Pretoria.

UMALI, D.L. & SCHWARTZ, L., 1994. *Public and private agricultural extension. Beyond traditional frontiers*. World Bank Discussion Paper No. 236. The World Bank, Washington DC.

UNIVERSITY OF THE NORTH, DEPARTMENT OF AGRICULTURAL ECONOMICS, 1996. *Northern Province household survey*.

ZWANE, E., 1999. Northern Province Department of Agriculture, Land and Environment. Personal communication.