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EVALUATION OF FERTILIZER APPLICATION IN RELATION TO FARM SPECIFIC SOIL POTENTIAL FOR DIFFERENT CROPS AT NANDONI: A PRELIMINARY SURVEY

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ABSTRACT

In this study the aim was to assess fertilizer application in communal lands with consideration of the given soil potential. This study came about owing to the damaging effects of improper management of fertilizer application, in particular Nitrogen, on the ecological balance. Further the importance of fertilizers in agricultural production and likely productivity of which it contributes significantly to the sustenance and livelihoods of the rural communities. The research approach employed was Participatory Rural Appraisal (PRA) inconjuction with questionnaires to gather data to address the research questions posed, which are What is the general approach for application of fertilizers? Is the application of fertilizers considering site specific soil characteristics? Are the farmers conscious of environmental limitations when applying fertilizers?

The most common fertilizer application approach used in the study area was broadcasting, followed by spot application which could be considered as a site specific fertilization method. This is due to the fertilizer being applied ‘directly’ on each plant. A small portion of farmers using fertilizers were found to be aware of the environmental effects of fertilizers.

Keywords: Fertilizer, Farmer, Participatory Rural Appraisal, Survey

1. INTRODUCTION

In quest for sustainable agricultural development, Limpopo Department of Agriculture commissioned the development of a Provincial Agricultural Development Strategy in 2004. This strategy is responding to a national call for a coordinated and effective rural development that will become sustainable (EnviroGIS and ARC, 2007). Agriculture as a sector, contributes significantly to the sustenance and livelihoods of the rural communities. Limpopo Province has been identified as one of the country's prime agricultural regions for production of crops and livestock. It is characterized by distinct climatic regions varying from semi-arid, arid to sub-humid climate. However, it is generally regarded as a water scarce province. It has diverse soils which vary in productivity. The soils are also vulnerable to various forms of degradation (Nesamvuni *et al*., 2003). This justifies the need to assess and characterize different agricultural areas at farm level to assess their agricultural development potential and manage them according to their capability. This will in turn help in implementing strategies that will ensure a profitable agricultural production incorporating environmental consideration (Petja *et al*., 2009).

Damage to the environment due to over application of nitrogen (N) fertilizer for crop production is a serious concern which leads to deleterious consequences (Ahmad *et al*., 1999). Reduction in applied N application can minimize the nitrate levels but forms part of a complex relationship with other factors such as denitrification, mineralization, and rainfall (Walker *et al*., 1997). The short and long term damage of over applying N is multifold: economic, environment, habitat, and human (Ahmad *et al*., 1999). Fertilizers applied to crops are a potential source of nutrient enrichment to surface waters. Therefore Nitrogen is also a potential contaminant of groundwater. Fertilizer recovery by crops with conventional farming systems is generally far from complete, with about 50 percent recovery of N. Nitrogen can be highly mobile it can be tied up in organic matter, carried through surface or subsurface water movement, or denitrified. Phosphorous and K, however, attach to soil particles and are carried away only by erosion. Nitrogen fertilizers can contribute NO_3 to groundwater reservoirs. Many people, for various reasons, are apprehensive about situations involving synthetic chemicals as contaminants in the water supply or food chain. It is becoming increasingly evident that these chemicals will be very difficult to keep out of the water or food chain if they are used extensively in crop production. Intensive monitoring and predictive programmes are helpful but not practical as they are expensive (Papendick *et al*., 1986). It is imperative that fertilizer application should not adversely affect the ecological balance. This study therefore attempts to assess the application of fertilizers in communal lands considerate of the given soil potential. Research Questions;

- What is the general approach for application of fertilizers?
- Is the application of fertilizers considering site specific soil characteristics?
- Are the farmers conscious of environmental limitations when applying fertilizers?

2. THE STUDY AREA

The Lambani study area is situated in the Thulamela Local Municipality of the Vhembe District Municipality, Limpopo Province (cf. **Figure 2.1**). The study area is part of the Nandoni Agricultural Hub earmarked for agricultural performance revival. Lambani forms part of phase 1 in terms of the initial investment in the Nandoni Hub and will be developed to a full business potential.

Lambani focus area covers about 122 ha of active farm lands consisting of 22 farmers. The dominant soils are Hutton, Dresden, Tukulu, Sepane and Vaalsrivier. The areas receive an average annual rainfall of 522 – 598 mm and the mean average annual temperature of 23˚
C. The main environmental threats are that the farm areas are in close proximity of the water bodies (river). The other threat is that the areas under irrigation risk leaching of fertilizers, and high sediment yield from shallow soils with occasional flooding on high clay soils. The area has a mean average growing season of about 86 – 96 days considerate of 31 % of rainfall coefficient variance (EnviroGIS, NRM and PriceWatehouseCoopers, 2009).

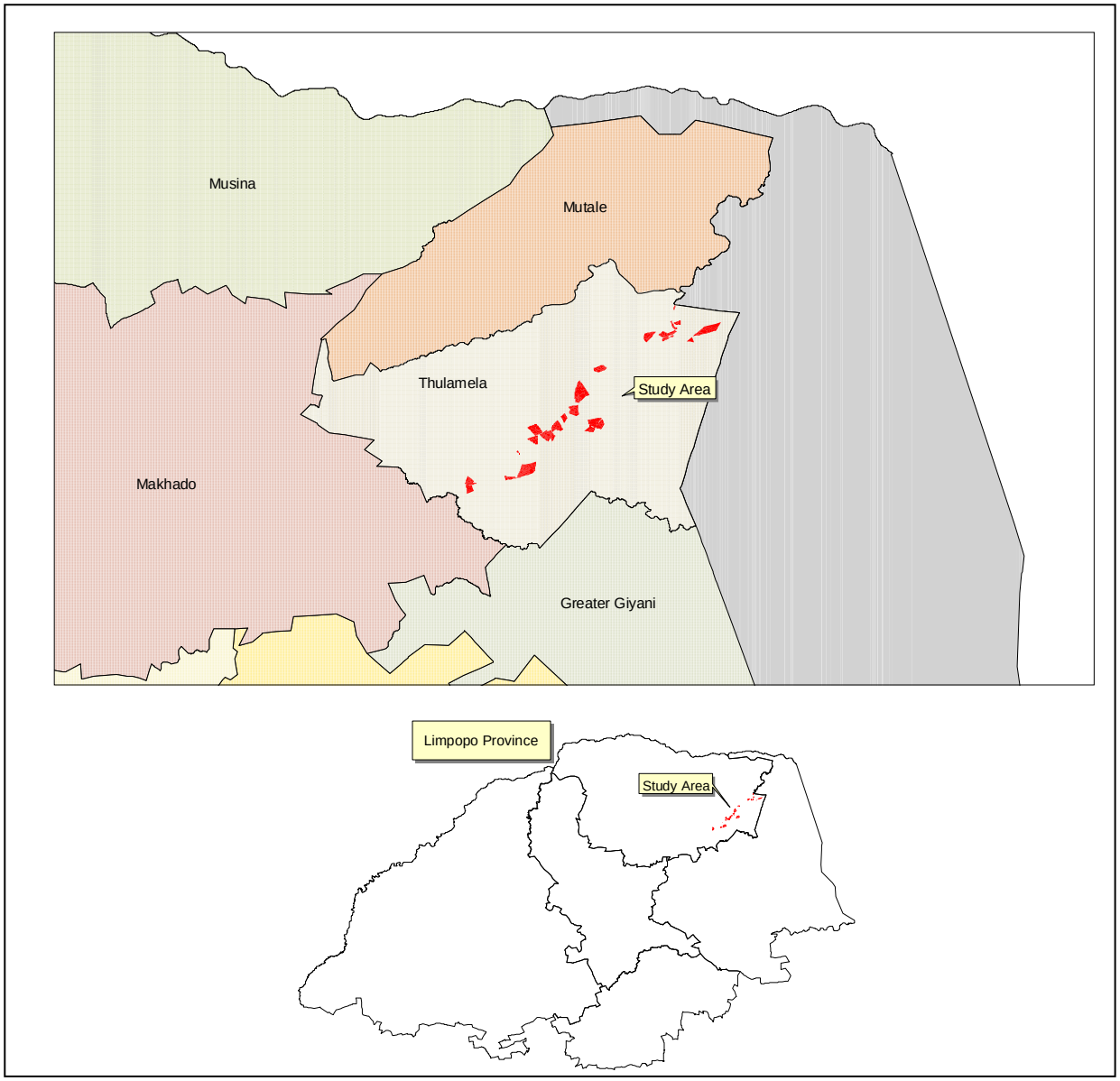

Figure 2.1 Locality Map of the Nandoni Agricultural Hub

3. METHODOLOGY

3.1. Research Design

In this study a social research approach was used which incorporated participatory farmers engagement. A Participatory Rural Appraisal (PRA) was adopted in this case. This method was deemed necessary based on it emphasizes on local knowledge and action. It uses practical way of

facilitating stakeholders to share information and ultimately come up with their own appraisals and plans. It was originally developed for use in rural areas. PRA has been employed successfully in a variety of settings to enable local people to work together to plan community-appropriate developments. Hence it was used in this study.

The survey targeted about 20 per cent of the farmers in each of the study site. An assumption made was that farmers will be available at the plots as is the case in areas of active farming. They will also be requested to be available through extension service should needs arise.

A systematic random sampling procedure was adopted. Farming plots were selected using a random walk procedure to where interviews were conducted at every fifth plot in a unidirectional fashion giving an allowance of one row across the sample points (ref. **Figure 3.1**). This is done to allow representation of the possible in field variability. In the events was farmers were unavailable, the interviewer move to the immediate next farm.

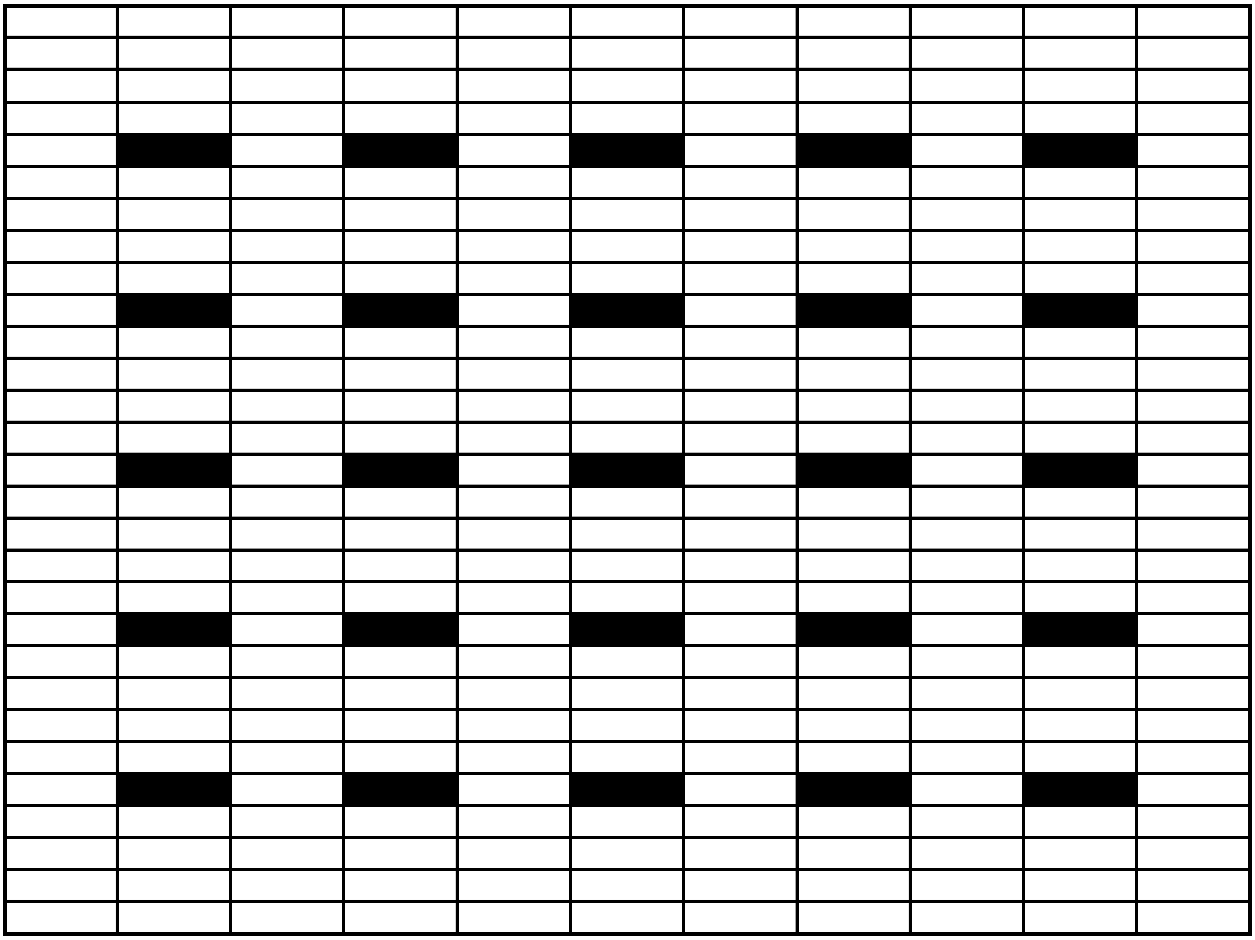

Figure 3.1 Sampling frame

3.2. Data Collection

Data was collected through the use of questionnaires/survey forms. This collected data includes biographic data, land ownership, crop production and fertilizer use, and institutional support services. However, information on socioeconomics was not asked as it has been detailed in the previous studies (EnviroGIS, NRM and PriceWatehouseCoopers, 2009).

3.3. Data Processing and Analysis

Observations and responses were recorded in the field. Completed questionnaires were coded into the database and the data was analyzed using relevant statistical packages. For each of the variables, descriptive statistics were provided an overall picture of the data.

4. RESULTS AND DISCUSSION

The survey results on the biographic of Lambani, shown in **Table 4.1**, indicate that all emerging farmers are from Black racial group with majority being female (72 %).

Table 4.1 Biographic data of Lambani Village in Vhembe District of the Limpopo Province

Sex			
	Female	**88**	**72%**
	Male	**35**	**28%**
	Total	**123**	**100%**
Race			
	Black	**123**	**100%**
	White	**0**	**0%**
	Other	**0**	**0%**
	Total	**123**	**100%**

Of the 123 emerging farmers interviewed 94 % have ownership of their land with 91 % in communal and 7 % freeholding tenure system (cf. **Table 4.2**). The average size of the farmland is 1.58 ha (with a range of 0.5 to 8 ha). About 97 % of the farmers said their land is arable, while 3 % said their land is non-arable.

Table 4.2 Land ownership, system of tenure and farmland classification of Lambani Village in Vhembe District of the Limpopo Province

Land ownership	**Own**	**Renting**	**Other**
	116	**0**	**7**
	94%	**0%**	**6%**
System of Tenure	**Communal**	**Freehold (with title deeds)**	**Other**
	112	**9**	**2**
	91%	**7%**	**2%**
Farmland classification	**Arable**	**Non-arable**	**Other**
	114	**3**	**1**
	97%	**3%**	**1%**

In **Table 4.3** information on the type of land preparation that the farmers used in the previous planting season (2009/10), indicates that 75 % of the farmers hire tractor to plough their field and12 % hire animal traction.

Table 4.3 Previous planting season land preparation by farmers in Lambani Village in Vhembe District of Limpopo Province

		Own	Hire
Land Preparation Method	Ploughed by Tractor	1%	75%
	Discing by Tractor	0%	0%
	Animal Traction	2%	12%
	Minimum Tillage	5%	0%
	Other	6%	0%

About 34 % of the surveyed farmers in Lambani Village are members of an irrigation scheme (cf. **Figure 4.1**). The average farmland under irrigation in the Village according to survey is 1.32ha (ranging from 0.50 to 5.00 ha). Of the 34 % of the farmer who are part of an irrigation scheme 10 % pay a membership. The average irrigation scheme membership fee paid by farmers is R 159.29 (ranging from R 30.00 to R800.00).

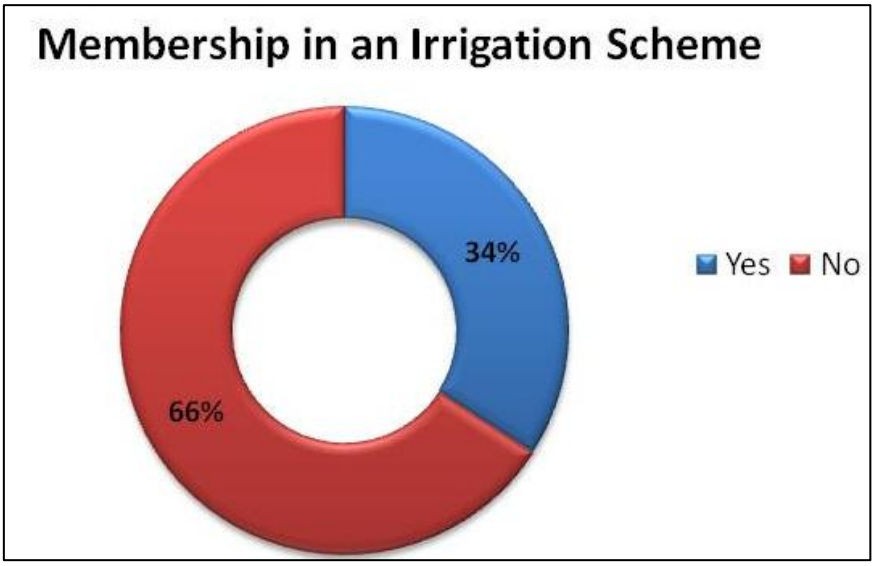

Figure 4.1 Chart of irrigation scheme membership in Lambani Village of Vhembe District in Limpopo Province

In **Figure 4.2** the per cent of farmer's whose major source of income is from crop sales are depicted to be 28 % of the 123 surveyed farmers.

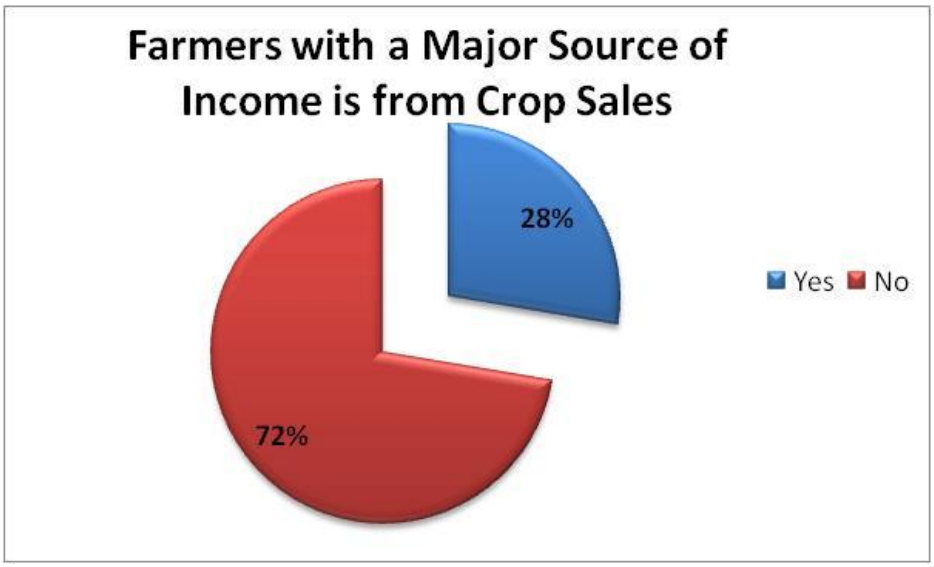

Figure 4.2 Farmers receiving a major source of their income from crop sales in Lamabani Village of Vhembe District in the Limpopo Province

The main method of fertilizer application used, by the 30 % of the farmer who fertilizer, is broadcasting followed by spot and lastly fertigation (cf. **Figure 4.3**). Only 24 % (ref. **Figure 4.4**) of the farmers surveyed were aware of the environmental effects of fertilizers. The 24 % of the farmers aware of the environmental effects of fertilizers more than 50 % indicated crop burning as an effect and more the 30 % identified erosion and health hazard (ref. **Figure 4.5**).

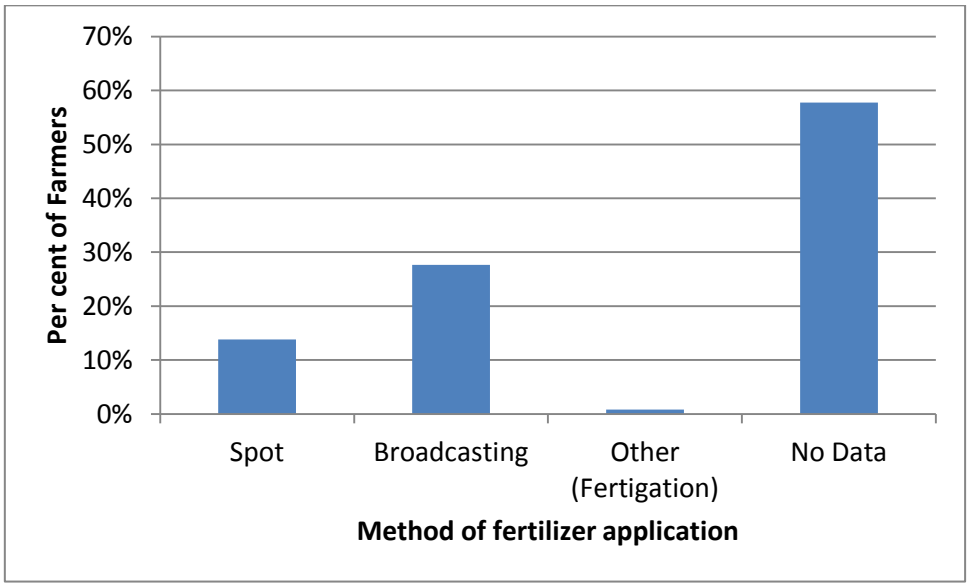

Figure 4.3 Method of fertilizer application employed by farmers in Lambani Village in Vhembe District of the Limpopo Province

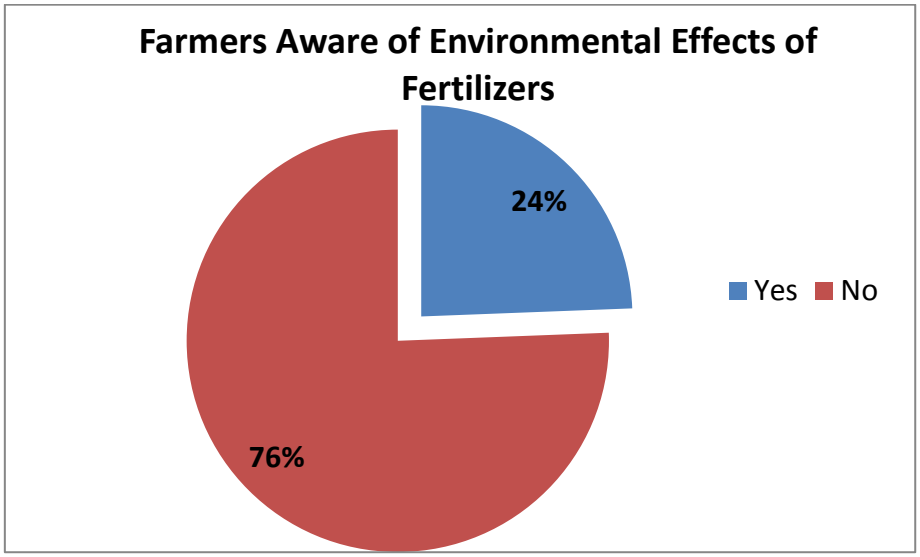

Figure 4.4 **Farmers aware of environmental effects of fertilizers in Lamabani Village in Vhembe District of the Limpopo Province**

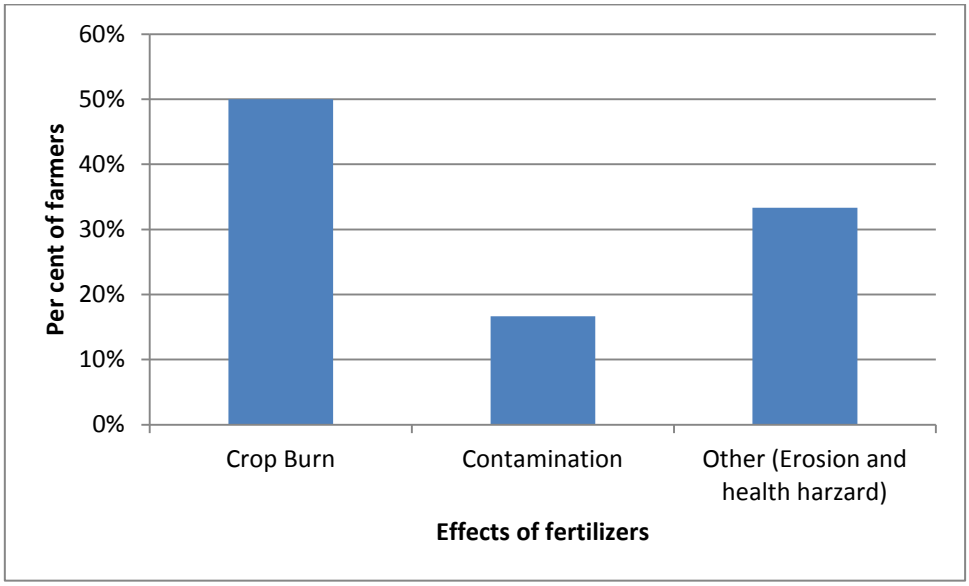

Figure 4.5 **Effects of fertilizers**

5. CONCLUSIONS AND RECOMMENDATIONS

Farming in Lambani Village, based on the survey results, could be said that it is dominated by females from a black racial group. Thus, highlighting the importance of gender roles to be considered in agricultural programmes planned and implemented in such Village as this was not considered in the past. Further majority of the farmers in the area have ownership of farm land that is arable as well as using communal tenure system. Ownership of land enables a farmer to be less hesitant to make long term invests as well as to adopt sustainable management practices.

The method generally used for preparing the land for planting is tractor ploughing, the services of which are hired. Further only 34 % of the farmers in the area were part of an irrigation scheme while only 10 % of them contribute in towards the payment of irrigation fees.

The survey indicated that 30 % of the farmers in the Lambani Village were using fertilizers to improve their produce. The most common approach used for fertilizer application discovered through the participatory engagement with the farmers was broadcasting, followed by spot which might be considered to be site specific fertilizer application owing to the nature of application (however this approach might not address specific location demands and supply) as opposed to the earlier method of application.

It was found that only 24 % of the farmers using fertilizers were aware of its effects on the environment. The effects which the farmers said there were aware of was crop burning followed by erosion and health hazard and lastly contamination. These results highlight the need for educating farmers on the management of agricultural chemical such as fertilizers.

A small portion of the interviewed farmers, about 28 % as opposed to 72 %, draw their income from sales of their produce. Hence it is recommended that future programmes that could aid farmers to improve their produce and excess to markets in Villages such as Lambani be support as they will contribute to empowering farmers and contribute to food security in the region..

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