Factors influencing agricultural extension officers' knowledge on practice and marketing of organic agriculture in North West Province, South Africa

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Abstract: This paper examines the factors influencing agricultural extension officers' knowledge on practice and marketing of organic agriculture in North West Province, South Africa. A simple random sampling technique was used to select 20 percent extension officers from which data were collected with a structured questionnaire and analyzed using frequency counts, percentages and multiple regression analysis. The results revealed that extension officers had a wide range of knowledge levels regarding marketing of organic agriculture as all the items had at least 55 percent. Significant determinants of knowledge on practice and marketing of organic agriculture were gender (t= 2.46), age (t= - 1.73), educational level (t = 1.75), working experience (t = - 1.71), job location (t = 2.72) and sources of information (- 3.02) . The results have several implications for training and educating extension officers in organic agriculture issues. [Life Science Journal 2010;7(3):91-98]. (ISSN: 1097-8135).

Keywords: Organic agriculture, extension officers, knowledge, marketing, South Africa

1. Introduction

Agriculture has reached the limits of available natural resources such that future increases in agricultural production and rural income must derive from intensification, rather than area expansion and exploitation of additional natural resources. Agriculture itself is changing and changing the quantity and nature of information farmers need. Information needs increase both with greater commercialization of agriculture and in light of the innovations that are likely to prove important in the future. Knowledge, information, skills, technologies, and attitudes are to be explored for the sustainable intensification of agriculture and rural development(FAO and World Bank, 2000). Agricultural extension plays an important catalytic role in agricultural and rural development as it brings the farming community information and new technologies that can be adopted to improve production, incomes and standards of living. Agricultural extension provides a channel by which farmers' problems are identified for research and the modification of agricultural policies. The extension system also organizes farmers into functional groups in order to gain access to production resources such as credit, inputs, marketing services and information. Agricultural extension programmes are very diverse from an international perspective as most are managed as public sector agencies and some nongovernmental organizations (NGOs while many private firms and private organizations conduct extension programs. An equally important variation occurs in the skill and competence of extension staff (Oladele and Sakagami, 2004). In competitive production environment, occasioned by the globalization policy, extension services must be oriented to markets and overcome the exclusive focus on production that ignored market demand and profitability as was the constraint of many past extension programs. Varied extension services are needed to help farmers remain competitive and profitable, diversify production, produce for niche markets, and move to higher-value products and more value-added production.

Agricultural extension is the most important source of information to farmers in most African countries (Agbamu, 2002) and play significant role in affecting farmers' adoption of innovations (Van den Ban and Hawkins, 1998). The effectiveness of extension service delivery is critically dependant on the knowledge of extension officers on the various agricultural innovations they disseminate to farmers, thus, the purpose of this paper is to identify factors that determine extension officers' knowledge levels on practice and marketing of organic agriculture. This is based on the fact that the knowledge of extension officers will influence their attitude and the kind of awareness they create on organic agriculture among farmers. Long and Sworzel (2007) noted that the mission of extension services is to provide research based information, educational programs and technology on farmers' needs and enabling them to make informed decisions about their economic, social and cultural well-being.

The goal of organic farming is to give priority to long-term ecological health, such as biodiversity and soil quality, rather than short-term productivity gains (IFOAM, 2006). Organic farming is a widely respected approach to overcoming the negative impacts of the Green Revolution on soil, air, water, produce, landscape, and humans worldwide. Organic farming was and is constantly being developed by farmers, scientists and concerned people all over the world. A central element of the organic farming method is the efficient use of on-farm and local resources like farmyard manure, indirect crop protection and local seed. Organic farming promotes the powers of self-regulation and resistance which plants and animals possess naturally and therefore, organic agriculture is not just a solution for more affluent countries but applied in every climatic region. In poorer countries especially, it can contribute to purposeful socio-economic and ecologically sustainable development (Kilcher, 2002; Mc Neely and Scherr, 2002; and Yussefi and Willer, 2003). Organic farming, therefore, has become an issue of public concern, but it has also become a big business. This business is being met by legislation and governmental standards on organic farming which include rules for processing, trading, monitoring, and certifying agricultural produce.

South Africa is not only self-sufficient in virtually all major agricultural products, but in a normal year it is also a net food exporter. However, with very low average rainfall and high variability within and between seasons, its agriculture is vulnerable to the effects of drought (FAO, 2006). However South Africa has been described as a fertile territory for GM crops and well ahead of the rest of Africa when it comes to biotech. Already more than 200 permits for field trials have been issued and three GMO crops are commercially available. This is predicated on the fact that agriculture is dominated by a small number of large-scale farms that are highly integrated into the commercial seed market dominated by Monsanto, Pioneer Hi-Bred and Sakata. The country's public research institutions, which have carried out biotech research since the apartheid years, are in the midst of a privatization blitz and the biosafety and intellectual property rights legislation in place favors the biotech industry.

Despite the above description of South African agriculture with reference to the prevalence of biotech and GMO based cropping, South Africa has had an organic sector for many years, although it has grown in 'fits and starts'. It comprises 250 certified farms and 45,000 hectares of certified organic land, which account for 0.05 % of the country's total agricultural area (IFOAM and FiBL, 2006). South Africa is one of the two countries in Africa with a robust domestic market, although it is underdeveloped and there are few, if any, price premiums for organic products. Most organic growers therefore look to Europe as their outlet area (IFOAM, 2003). South Africa is also a market destination for organic produce from nearby southern African states, particularly Mozambique. Organic agriculture is generally assumed to cater to a luxury niche whose customers can afford to shop in health food, rather than hard discount, stores however the reality today is that organic supply is now the world's fastest-growing food sector, increasing at 15 percent a year over the last decade and worth some 40 billion dollars in 2006. Consumer studies too reveal that organic buyers are not so much better-off in status as generally more aware of food issues.

Available information and the sources of such information have been one of the critical factors affecting adoption rates of innovations among farmers (IFOAM, 2003). Van den Ban and Hawkins (1998), Rogers, (2003) and Fuglie and Kascak (2001) illustrated quantitatively the positive role that extension officers play in diffusing agricultural innovations. Oladele (2005) reported that farmers indicated that the most dependable source of information is agricultural extension agent. OFRF (1999) and Wheeler (2007), noted that organic farmers have often complained about agricultural professionals' negative attitude about, and lack of knowledge of, organic farming. Anecdotal evidences also suggests that organic farmers often state that if professionals remained open-minded and took the time to learn more about organic farming then they would be more likely to think favourably about it as a farming system. Wheeler (2008) asserted that conservative or negative attitudes within the agricultural scientific and academic community are seen as significant barriers to research, extension support and hence the adoption of organic agriculture by farmers. There have been many studies on the consumer side with respect to organic agriculture, but there have been no studies exploring the determinants of knowledge level of extension officers on organic agriculture. This paper attempts to isolate these determinants as this would in reveal the knowledge level of the extension officer and how they can educate their farmers on issues related to organic agriculture.

2. Materials and Methods

The study was carried out in North West province, South Africa. The study population was all extension officers (200) in the province. Extension officers in this study are employees of the Department of Agriculture that have the responsibilities of providing information to farmers on all aspect of farming as well as advisory

services. A simple random sampling technique was used to select 20 percent extension officers from which data were collected. A structured questionnaire was developed based on the study objectives and related literature which was divided into three parts. The first sought demographic characteristics of extension officers and the second elicited information on knowledge on climate change which was anchored as True (2) or False (1) on a scale with 93 items covering sections on practice, health, environment and marketing. The questionnaire was faced validated by lecturers from the Department of Agricultural and Extension at North West University, and their suggestions were incorporated into the instrument before data collection. The questionnaire had a reliability coefficient of 0.87 determined by the split-half technique. Data obtained was analyzed with the Statistical Package for Social Sciences (S.P.S.S) using frequency counts, percentages, means and linear multiple regression analysis.

A linear regression model was used to isolate the determinants of knowledge level of extension officers on organic agriculture. A probit model is appropriate when the dependent variable to be evaluated is dichotomous. The relationship between the probability of a variable Pi and its determinants q is given as:

$Pi = \beta qi + \mu i$ …… (1)

Where Pi=1 for Xi>Z; i=1,2 ....., n; qi is a vector of explanatory variables and β is the vector of parameters. The probit model computes the maximum likelihood estimator of β given the non-linear probability distribution of the random error μi.

When the dependent variable takes more than two values and these two values have a natural ordering, the use of an ordered probit is indicated and estimated using the maximum likelihood method.

Most studies on organic farming have used probit or logit models while some have used ordered probit specification. In the probit model the discrete dependent variable Y is a rough categorization of a continuous, but unobserved variable Y^*. If Y^* could be directly observed then standard regression methods would be used (such as assuming that Y^* is a linear function of some independent variables, for example:

$Y^* = \beta_1 X_{1i} + \ldots\ldots\ldots \beta_j X_{ji} + ui$ ……(2)

In this study, Y^* is the knowledge level of extension officer on organic which is observable with a lower and upper limit, then the use of linear regression is justified. The model is therefore specified as

$Y = f(X_1, X_2, \ldots, X_{10})$ …….(3)

The actual model specification is:
Knowledge of organic farming
$= \beta_0 + \beta_1$Gender $+ \beta_2$Age $+ \beta_3$Religion $+ \beta_4$Educational level $+ \beta_5$Studying for higher degree $+ \beta_6$Working experience $+ \beta_7$Rural-urban background $+ \beta_8$Job location $+ \beta_9$Information sources $+ \beta_{10}$No of farmers covered $+ \beta_{11}$Living in job area $+ u$.

3. Results

Table 1 presents the personal characteristics of extension officers in North West Province, South Africa.

Table 1. Personal characteristics of extension officers

Personal Characteristics	Description
Gender	Predominantly male 52.5 %
Age	Mean = 42.5 years
Marital Status	72.5 %Married
Religion	Predominantly Christianity 82.5%
Educational level	Predominantly Diploma 85%
Household size	Mean = 4.2 persons
Working experience	Mean = 14 years
Living in job location	Predominantly Yes 85%
Job designation	Predominantly extension officer 43%

In Table 2, the results of extension officers' knowledge on marketing of organic agriculture were presented.

The results of extension officers' knowledge on practice of organic agriculture were presented in Table 3.

The result of multiple regression analysis on the determinants of extension officers' level of knowledge on the practice and marketing of organic agriculture is shown in Table 4.

Table 2: Knowledge on marketing of organic agriculture

Statements	True	False
Consumers, who want to buy organic products will support organic farming	37(92.5)	3 (7.5)
Experts in standard setting, monitoring, control, and certification will support organic farming	32(80)	8(20)
Consumption and environmental responsibility will enhance support for organic farming	29(72.5)	11(27.5)
Organic agriculture will lead to improvements to external factors.	22(55)	18(45)
The closer the farmers are to the market and information centres, the better the tendency to adopt organic farming.	28(70)	12(30)
Market for organic products is poorly developed and organic products are either home delivered and or sold in the few supermarkets and hotels.	33(82.5)	7(17.5)
Organic agriculture will ensure the quality of the products	26(65)	14(35)
Consumers who sometimes buy organic food are more concerned with health reasons.	29(72.5)	11(27.5)
Organic agriculture will ensure the economic value of food	28(70)	12(30)
Product quality characteristics affect consumers' preferences for organic food;	24(60)	16(40)
Religion influences Organic agriculture practices and marketing	26(65)	14(35)
Organic agriculture will address those that believe that a price premium on a product signals a better product	23(57.5)	17(42.5)
Organic foods are cheaper	23(57.5)	17(42.5)
Marketability of organic agriculture product is low in RSA	25(62.5)	15(37.5)
Organic methods often require more labour, providing rural jobs but increasing costs to urban consumers.	29(72.5)	11(27.5)
Organic farming yields more and uses less land for the same output level.	31(77.5)	9(22.5)
Organic production management system offered a real and affordable means to break out of poverty and obtain food security in marginal areas."	27(67.5)	13(32.5)
Organic agriculture saves farmers significantly from expensive insecticides, fungicides and other pesticides.	26(65)	14(35)
Consumers who recognise the greater food value of organic produce will be willing to pay premium prices for it.	31(77.5)	9(22.5)
Food quality is more important than price.	37(92.5)	3(7.5)
Organic food buyers were more health conscious, and did not trust conventional food.	34(85)	6(15)
The motivation for buying organic was the absence of contaminants or health reasons.	35(87.5)	5(12.5)
Availability and price will influence actual purchase of organic foods	35(87.5)	5(12.5)

Table 3. Knowledge on practice of organic agriculture

Statements	True	False
Organic farming is a form of agriculture that relies on natural inputs for crop and animal production	34(85)	6 (15)
Organic farming requires considerably more skill to farm -	34(85)	6 (15)
Organic agriculture promotes the health of the agro-ecosystem related to biodiversity, nutrient biological cycles, soil microbial and biochemical activity.	34(85)	6 (15)
Organic agriculture sustains the health of soils, ecosystems and people.	40 (100)	

Organic agriculture relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects.	34(85)	6 (15)
Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.	40(100)	
Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.	39(97.5)	1(2.5)
Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities	32(80)	8(20)
Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.	39(97.5)	1(2.5)
Farmers, who are willing and able to adopt organic land use systems; will support organic farming	40(100)	
Organic agriculture will lead to improvements in availability of food	35(87.5)	5(12.5)
Organic agriculture will lead to improvements to natural capital	26(65)	14(35)
Organic agriculture will lead to improvements to social capital	37(92.5)	3(7.5)
Organic agriculture will lead to improvements to human capital	24(60)	16(40)
Organic agriculture will lead to improvements to physical capital.	27(67.5)	13(32.5)
Organic agriculture will ensure the nutritional value of farm products	31(77.5)	9(22.5)
Food insecurity will not enhance support for organic agriculture	23(57.5)	17(42.5)
Organic agriculture is based on the principle of fairness	25(62.5)	15(37.5)
Organic agriculture is not a popular practice in South Africa	33(82.5)	7(17.5)
Organic agriculture is in practice in South Africa	23(57.5)	17(42.5)
Organic agriculture involves the use of indigenous methods	22(55)	18(45)
Organic farming requires more land holds only for cash crops.	37(92.5)	3(7.5)
Organic farming enhances crop-livestock integration	34(85)	6 (15)
Effective organic pest control requires a thorough understanding of pest life cycles and interactions.	26(65)	14(35)
Weeds are controlled mechanically, and through the use of cover crops and mulches in organic farming	26(65)	14(35)
Organic agricultural methods are internationally regulated and legally enforced by many nations,	25(62.5)	15(37.5)
Organic farmers also use certain processed fertilisers such as seed meal, and various mineral powders such as rock phosphate and greensand, a naturally occurring form of potash.	37(92.5)	3(7.5)
Organic pest control involves allowing for an acceptable level of pest damage, intro-ducing beneficial organisms,	31(77.5)	9(22.5)
Organically grown compete better with weeds that are present.	33(82.5)	7(17.5)
Organic farming is more labour intensive than chemical/mechanical agriculture	35(87.5)	5(12.5)
Organic farming requires greater interaction between a farmer and crops for observation and timely intervention	32(80)	8(20)
Organic growers do not use genetically modified or engineered food crops,	27(67.5)	13(32.5)
Organic agriculture yields decline over time	27(67.5)	13(32.5)
Organically grown plants are more droughts tolerant.	32(80)	8(20)
Organic agriculture will address those that are concerned with chemical hazards among farm workers	31(77.5)	9(22.5)
A healthy plant grown organically in properly balanced soil resists most diseases and insect pests.	26(65)	14(35)

Table 4. Multiple regression analysis of determinants of knowledge on practice and marketing

	Practice		Marketing	
	Reg Coeff/ SE	t	Reg Coeff/ SE	t
(Constant)	152.926 (31.310)	4.884	47.426 (12.961)	3.659
Gender	32.2(13.06)	2.46	10.3(5.36)	1.92
Age	-.986(.569)	-1.732	-.310(.236)	-1.316
Religion	-2.718(2.629)	-1.034	-1.566(1.088)	-1.439
Educational level	0.75(0.43)	1.75	0.44(0.22)	1.98
Studying for higher degrees	-5.064(8.335)	-.608	-4.337(3.450)	-1.257
Working experience	-.550(.321)	-1.714	-.331(.133)	-2.490
Rural-urban background	9.513(10.772)	.883	5.796(4.459)	1.300
Job location	19.499(7.179)	2.716	7.809(2.972)	2.628
Number of farmers covered	-.099(.617)	-.161	.123(.256)	.482
Sources of information	-11.33 (3.74)	-3.02	-2.79(1.26)	-2.20
F	2.47		3.22	
p	0.03		0.03	
R	0.59		0.69	
R square	0.35		0.48	

4. Discussions

The table shows that extension officers were predominantly male (52.5%) with the mean age of 42.5 years, married (72.5%) and 82.5% were Christians. In terms of the educational level, 85% of the extension officer had Diploma as their qualification and a mean of 14 years as working experience. Table 1 further revealed that there was a mean of 4.2 persons per household and 85% live in their job location, rural or peri-urban notwithstanding. In terms of job designation 43% were extension officer with the remaining percentage in higher positions and cadre. This agrees with the findings of (Zwane, 2009) who reported that extension officers in Limpopo province of South Africa were mainly males, between 40 t0 49 years, and had Diploma as their educational qualification. Bembridge(1991), also reported similar findings in terms of the personal characteristics of extension officers in South Africa.

In Table 2, the results revealed that extension officers had a wide range of knowledge levels regarding marketing of organic agriculture as all the items had at least 55 percent. Prominent items with right responses were consumers, who want to buy organic products will support organic farming (92.5%); food quality is associated with price(92.5%) the motivation for buying organic was the absence of contaminants or health reasons (87.5%) and availability and price will influence actual purchase of organic foods(87.5%).However extension officers had low knowledge on item s such as organic agriculture will lead to improvements to external factors (45%); product quality characteristics affect consumers' preferences for organic food(40%); organic agriculture will address those that believe that a price premium on a product signals a better product(42.5%) and organic foods are cheaper(42.5%). The results have several implications for training and educating extension officers marketing of organic agriculture as[4] reported that extension officers often work

reactively rather than proactively because of the large number of clients and the small number of extension agents.

From Table 3, the results revealed that extension officers had a wide range of knowledge levels regarding practice of organic agriculture. No respondents answered all of the knowledge test questions incorrectly, nor did any respondents answer all questions correctly. Items with high proportion of right responses were organic agriculture sustains the health of soils, ecosystems and people(100%); organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them (100%); farmers, who are willing and able to adopt organic land use systems will support organic farming (100%); farmers, who are willing and able to adopt organic land use systems; will support organic farming(100%); organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible (97.5%) and organic agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment (97.5%) . it can be inferred from the results that extension officer shad more knowledge on practice than marketing of organic agriculture. Conversely, extension officers' recorded low knowledge on item s such as organic agriculture involves the use of indigenous methods (45%); organic agriculture will lead to improvements to human capital (40%); food insecurity will not enhance support for organic agriculture (42.5%) and organic agriculture is in practice in South Africa (42.5%).

In table 4, the independent variables were significantly related to knowledge levels of extension officers on practice and marketing of organic agriculture with F values of 2.47 and 3.22, $p < 0.05$ respectively. Also, R values of 0.59 and 0.69 showed that there was a strong correlation between independent variables and knowledge levels of extension officers on practice and marketing of organic agriculture respectively. The result further predicted 35 and 48 percent of the variation in knowledge levels of extension officers on practice and marketing of organic agriculture. Significant determinants of knowledge on practice of organic agriculture were gender (t= 2.46), age (t= - 1.73), educational level (t = 1.75), working experience (t = - 1.71), job location (t = 2.72) and sources of information (- 3.02) . Similarly, significant determinants of knowledge on marketing of organic agriculture were gender (t= 1.92), educational level (t = 1.98), working experience (t = - 2.49), job location (t = 2.62) and sources of information (- 2.20). It implies that the more there are more male extension officers, with high educational level and residing in their job location the higher the knowledge level on practice and marketing of organic agriculture. However, as extension officers get older, with few years of working experience and poor exposure to sources of information the lower the knowledge on practice and marketing of organic agriculture. The trend and the sign of the coefficients could be due to the fact that there is male dominance of the extension service delivery in the study area; with majority of the extension officer having diploma as their education al qualification and residing in their job location. The acquisition of a higher level of education would improve the competence and skills of the extension officers and there would be more interaction and awareness of farmers' enterprises when they reside within their job location. Extension officers with few years of working experience would not have mastered the diversity of interests in the farming enterprises among farmers; while poor exposure to sources of information such as workshops and training would impact negatively on the knowledge level of extension officers. Wheeler[17] found that similar variables influence agricultural professional views on organic agriculture in Australia.

However South Africa has been described as a fertile territory for GM crops and well ahead of the rest of Africa when it comes to biotech. Despite the description of South African agriculture with reference to the prevalence of biotech and GMO based cropping, South Africa has had an organic sector for many years and is increasingly stronger. Agricultural extension is the most important source of information to farmers in most African countries and play significant role in affecting farmers' adoption of innovations. The effectiveness of extension service delivery is critically dependant on the knowledge of extension officers on the various agricultural innovations they disseminate to farmers. The study showed that extension officers in North west Province, South Africa were predominantly male, with the mean age of 42.5 years, married, Christians, had Diploma as educational qualification and a mean of 14 years as working experience. Extension Officers had a wide range of knowledge levels regarding the practice and marketing of organic agriculture as all the items had at least 55 percent. Significant determinants of knowledge on practice and marketing of organic agriculture were gender, age, and educational level, working experience, job location and sources of information. The results have several implications for training and educating extension officers in organic agriculture issues. The results of this study add to the existing literature on the determinants of knowledge levels among extension officers and thus will inform educational and training policy on agricultural innovations in

order to improve the competence of extension officers.

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