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LINKAGE ACTIVITIES AMONGST RESEARCHERS, EXTENSION AGENTS, FARMERS, INPUT DEALERS, AND MARKETERS TOWARDS AGRICULTURAL INNOVATION SYSTEMS IN THE NORTH WEST PROVINCE, SOUTH AFRICA.

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ABSTRACT

This paper examined the research- extension- farmer- input dealer and marketer linkage activities in the North West Province of South Africa. A simple random sampling technique was used to select researchers, extension agents, farmers, agricultural input dealers and marketers. Their responses in linkage activities were elicited through a structured questionnaire. The F value for linkage = 41.817($p< 0.05$) shows that there is a significant difference among stakeholders with extension agents having the highest mean of 51.63. In contrast, the marketers have the lowest mean of 37.16. This indicates that extension agents were involved in more linkage activities than other stakeholders in the agricultural innovation systems covered in this study.

Keywords: Linkage, innovation, agricultural innovation systems, collaboration

1. INTRODUCTION

Innovation is the process by which organisations master and implement the design and production of goods and services that are new to them, irrespective of whether they are new to their competitors, their country, or the world (Dimelu & Anyanwu, 2008:10). Hall, Mytelka & Oyeyinka 2006:13, argues that innovation is neither research nor science and technology, but rather the application of knowledge to achieve desired social or economic outcomes. However, the processes of acquiring knowledge requires extensive linkage activities amongst different stakeholders. An innovation system is a network of organisations, enterprises, and individuals focused on bringing new products, new processes and new forms of organisations into economic use, together with the institutions and policies that affect their behaviour and performance (World Bank, 2012:2). A system of innovation is also described as major social organisations that affect the revealing, acknowledgement, generation and diffusion of technical and institutional knowledge over time by Dimelu & Anyanwu, (2008:10).

Agricultural innovation systems aim at accessing knowledge and using it in a manner that would create wealth and social well-being by adding value to the existing knowledge, resources, and skills already available. The main idea behind this approach is that determinants of technological change are not only to be found in individual firms or in research institutes, but also in a broad societal structure in which organisations, as well as

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knowledge institutes, are embedded. Innovation system studies have pointed out the influence of societal structures on technological change, and indirectly on long-term economic growth within nations, sectors or technological fields. Spielman (2005) defined innovation systems as a set of interrelated agents, their interactions, and the institutions that condition their behaviour, with respect to the common objective of generating, diffusing, and utilising knowledge and/ or technology.

The concept linkage implies communication and working relationships to be established between different organisations, but to still pursue commonly shared objectives in order to have improved agricultural productivity. An important set of linkages are those comprising of the agricultural economic development support systems, including credit, supplies, and markets. The agricultural production system in the North West Province consists of the Agricultural Research Council (ARC), which represents the research sub-system, farmers' producer organisations, agricultural input dealers, marketers, the directorate of extension services in the department of agriculture, forestry and fisheries which provide extension services for farming communities, the North West University Faculty of Agriculture, agribusiness and other agricultural research institutions. Linkage activities are coordinated and agricultural decisions are made for all these stakeholders. These organisations contribute to the development, diffusion and application of improved knowledge/ technologies and influence the process of change in agriculture. Ideally, interaction through linkages facilitate information, skills, and knowledge transfer. The performance of the whole system depends upon the strength of linkages amongst stakeholders. The problem of poor production has been attributed to weak linkages, existing between research, extension officers, and farmers (Oladele, Sakagami, & Toriyama, 2006:197). However, linkages amongst different stakeholders are crucial to enhance the impact of new technologies for farmers as weak linkages will be represented in a systematic bottleneck in the agricultural innovation system and can limit their effectiveness in contributing to development (Rimawi, Tabieh & Al-Qudah, 2012:117). This affirms that a lack of strong linkage causes disruption in technology flow and low adoption rates. However, increased time lags between development and adoption of new technology reduces efficiency in the use of resources and results in unnecessary competition and duplication of activities.

2. DEFINITION OF PROBLEM

An agricultural innovation system is a complex set of functions and linkages amongst different stakeholders. To increase agricultural productivity and farm household income, while maintaining the resource base and addressing equity concerns, innovation systems require an interactive technology system whereby farmers and farm organisations, research, extensions, input suppliers, non-governmental organisations and other agencies work together in a co-ordinated manner (Oladele,2013: 15).

The Department of Agriculture Forestry and Fisheries (DAFF, 2009) reported that there is a weak linkage between organisations in the agricultural production system. Therefore, the aim of this paper was to examine linkage activities amongst researchers, extension agents, farmers, agricultural input dealers, and marketers.

3. PROCEDURE

The study was conducted in the North West Province of South Africa. The study population consisted of researchers from the North West University and the Agricultural Research

Council, farmer organisations, input dealers, marketers, and extension agents from the directorate of extension services in the Department of Agriculture Forestry and Fisheries (DAFF). A list of researchers, extension agents, and farmers was obtained from their respective organisations within the North West Province, and the list served as a sampling frame for the study. For input dealers and marketers, there was no definite sampling frame. The frame for different groups was as follows: extension agents from the Department of Agriculture and Rural Development (195), researchers from agricultural research council and the North West University (135), registered farmers from African Farmers Association of South Africa (AFASA), the National African Farmers Union (NAFU) and the North West Emerging Red Meat Producer Organisation (195). A Simple random sampling technique was used to select respondents since each individual has the same probability of being chosen at any stage during the sampling process. The respondents were chosen in such a way that each member of the population was represented. A total of 205 respondents were randomly selected as follows: 60 extension agents, 50 researchers, 35 farmers, 30 input dealers, and 30 marketers. Primary data was collected using an interview schedule based on a structured questionnaire. Multiple regression was used to show the relationship between the socio-economic characteristics of farmers, extension agents, researchers, input dealers, and marketers whereas a one-way analysis of variance (ANOVA) was used to show their linkage activities.

4. FINDINGS

Table 1 presents the multiple regression analysis, showing the relationship between socio-economic characteristics of farmers, extension agents, researchers, input dealers, and marketers. The socio-economic variables were used as explanatory variables to determine collaboration between these characteristics. The differences found between the socio-economic characteristics were significant, positively correlated to the collaboration with multiple coefficient of correlation (R) being 0.936, 0.745, 0.859, 0.891 and 0.839 respectively. Similarly, the variation in collaboration that was accounted for by the socio-economic characteristics of farmers, extension agents, researchers, input dealers, and marketers were: 0.88%, 0.56%, 0.74%, 0.79% and 0.80 respectively

Significant determinants of collaboration amongst farmers included contact with extension agents ($t = 2.14$, $p < 0.05$) and sources of credit ($t = -1.84$, $p < 0.05$). For extension agents, these were working experience ($t = -1.91$, $p < 0.05$) and number of communities covered ($t = -3.49$, $p < 0.05$), while for researchers working experience ($t = -4.05$, $p < 0.05$) and the kind of research done ($t = -1.96$, $p < 0.05$) was significant. For input dealers, significant determinants of collaboration for the location of business ($t = 4.52$, $p < 0.05$) and sources of products ($t = 3.77$, $p < 0.05$) were important, while for marketers, educational level ($t = 3.10$, $p < 0.05$) and the location of business ($t = 2.59$, $p < 0.05$) were significant. The implications of these significant variables are such that they are considered to be important variables to be properly examined to forge strong collaborations amongst these stakeholders in agricultural innovation systems in the study area.

Table 1: Multiple regression analysis between socio-economic characteristics and collaboration of farmers, extension agents, researchers, input dealers, and marketers.

	Farmers	Extension agents	Researchers	Input dealers	Marketers
	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)
Constant	-29.71 (9.65)	71.796 (11.429)	-21.97(7.15)	-73.03 (34.21)	96.449 (41.73)
Gender	-1.273(1.451)	-1.032 (1.109)	1.433 (2.573)	-2.838 (3.024)	-0.457 (2.411)
Age	-0.003(0.089)	0.058 (0.074)	0.196 (0.187)	0.055 (0.239)	-0.086 (0.223)
Marital status	-1.384(1.234)	0.483 (0.608)	-1.147 (2.326)	-2.927 (0.2666)	-2.998 (3.234)
Household size	-0.617(0.427)	-0.293 (0.278)	-0.127 (0.904)	0.700 (0.963)	2.122 (2.054)
Educational level	1.115(1.101)	0.519 (0.561)	0.348 (1.513)	-1.156 (1.049)	**-4.87 (1.57)**
Working experience	-0.148(0.183)	**-0.1.43 (0.75)**	**-0.32(0.08)**	0.269 (0.278)	-
Organisation membership	-1.129(0.855)	-	-3.823 (2.891)	-	-
Contact with extension agents	**-13.58(7.35)** [8]	-	-	-	-
Distance from extension agents	.673(1.794)	-	-	-	-
Source of credit	**1.59(0.66)**[8]	-	-	-	-4.432 (3.009)
Currently studying	-	-0.919 (.863	-0.976 (1.816)	-3.403 (3.041)	-12.718 (13.391)
Job location	-	1.000 (.821	3.266 (3.199)	**0.85 (0.19)**	**-2.05 (0.79)**
Communities covered	-	**-0.765 (0.21)**	-	-	-
Farmer group	-	0.030 (0.474)	-	-	-
Number of farmers covered	-	-0.007 (.005)	-	-	-
Kind of research	-	-	**3.60(1.84)**	-	-
Source of information	-	-	2.035 (2.516)	1.716 (4.755)	-
Source of products	-	-	-	**2.15 (0.57)**	-
Dealership type	-	-	-	0.342 (1.546)	-
Constraints with farm inputs	-	-	-	4.508 (4.371)	-
Where purchasing goods	-	-	-	-	2.514 (2.068)
Distance to market	-	-	-	-	-0.654 (1.416)
F	5.592	2.84	4.833	2.346	1.753
P	0.001	0.03	0	0.076	0.067
R	0.936	0.745	0.859	0.891	0.839
R Square	0.88	0.56	0.74	0.79	0.80

In Table 2, the ANOVA results show the linkage activities amongst marketers, researchers, input dealers, farmers, and extension agents in the North West Province. The F value for linkage = 41.817 ($p < 0.05$), which indicates that there is a significant difference amongst stakeholders, with extension agents having the highest mean of 51.63, and the marketers with

the lowest mean of 37.16. This indicates that more extension agents were involved in linkage activities than other stakeholders. The level of involvement in the decreasing order of magnitude was extension agents, farmers, input dealers, researchers, and marketers. The focus of the mandate and the peculiarity tasks and assignments could be the main reasons for the differing levels of involvement in linkage activities.

Table 2: One-way ANOVA showing differences amongst marketers, researchers, input dealers, farmers, and extension agents in the North West Province.

LINKAGE	**Sum of squares**	**df**	**Mean square**	**F**	**Sig**	**Groups**	**n**	**mean**
Between groups	6133.21	4	1533.3	41.82	0	Marketers	30	37.16[a]
						Researchers	50	41.36[b]
						Input dealers	30	42.80[b]
Within groups	7333.39	200	36.67			Farmers	35	50.02[c]
TOTAL	13466.61	204				Extension agents	60	51.63[c]

5. CONCLUSION

The linkage activities affecting collaboration of stakeholders in the North West Province show a wavering degree of involvement to establish closer relationships between farmers, extension agents, researchers, marketers, and input dealers. The preceding has helped to determine the level of involvement of stakeholders in the prescribed activities, which are aimed at forging a closer collaboration and feasible interaction amongst them. The degree of involvement has not been as sufficient as expected to be amongst all stakeholders. The findings of the current study show that extension agents were more involved in linkage activities compared to the other stakeholders. The level of involvement in the decreasing order of magnitude were extension agents, farmers, input dealers, researchers, and lastly, marketers. It is therefore, recommended that constraints to effective involvement in the linkage activities be eliminated in order for the stakeholders to utilise the linkage mechanism effectively for sustainable agricultural innovation systems to work. Thus, ensuring that implemented innovations will be more effective to enhance the overall production and livelihoods of farmers.

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