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A Comparison of the Socio- Economic Characteristics of Dairy-Crop Integrators versus Non Integrators: A Case Study in Elgeyo-Marakwet County, Kenya

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Abstract
The aim of this study was to compare the different inherent socio economic characteristics amongst the dairy-crop integrators and non integrators in Elgeyo-Marakwet County, Kenya. The study carried out a census of 85 integrators and 85 non integrators. The data were collected with the help of a structured questionnaire. Descriptive statistics such as means and percentages were used to present the findings. The study found out that Integrators had a higher household size mean unlike the non integrators. The integrators had a lower mean in years of schooling of as compared to that of non integrators who had a higher mean of years of schooling. On the other hand, Integrators had a larger size of land on average as compared to non integrators. The study therefore recommends policy interventions to enhance access to credit, reduce illiteracy levels among rural entrepreneurs through training and extension services.
Key words: Integration, Non-integration, Off-farm income, Household

1. INTRODUCTION

Dairy-crop integration is a form of mixed farming in which the farmer rears dairy cows and plants crops in his farm in such a manner that there is constant interaction and complementarities between the dairy cows and the crops. On the contrary, mixed crop-livestock farming is a type of a farming system where livestock contributes towards adding value to crop products as well as assisting in diversifying crop rotations. In addition to, they help to recycle nutrients. This system of farming combines crops and livestock in varying degrees. It has been observed that majority of farmers who have little access to resources rely on mixed systems of farming. On the livestock side, ruminants (cows, sheep, or goats) provide added value by converting fibrous feeds like straws, maize stovers and crop residues. Monogastrics (pigs, donkeys and poultry) also provide cash income by converting by - products like grain to high value foods, and thereby serving as a saving account for subsistence farmers (Hans *et al.,* 2006).

Diversification occurs where components such as crops and animals co-exist rather independently on the farm. Their combination serves to reduce risks, but their interactions are minimal. Nutrient flows are rather linear in this case. This form of mixing does not involve recycling of resources to a significant degree. Integration occurs where the components of the farm are interdependent, for example, where animals providing dung while consuming crop residues (Savadogo, 2000).

It has been pointed out that several agricultural activities increase greenhouse gas emissions. On the other hand, it is increasingly becoming better appreciated by the public as well as by the producers that selected agricultural practices can greatly increase productivity and incomes while simultaneously reducing the impact of climate change-related economic, social and environmental effects. These include minimizing mechanical soil disturbance and increasing soil organic matter which help reduce effects of dry periods on crop productivity and farm output. Similarly, it is possible to increase biomass in quantity and quality, and thereby increase livestock output in small-scale integrated systems. Therefore, the integration of crop and livestock production systems increases the diversity, along with environmental sustainability, of both sectors. At the same time it provides opportunities for increasing overall production and economics of farming (FAO, 2010).

Although direct consumption of crops provides more protein and energy to humans than when crops are processed by livestock (Spedding, 1988), and although some livestock production systems have contributed to environmental degradation, livestock can utilize crops and residues not suitable as food and fiber for humans. In addition, crop–livestock systems that are appropriately integrated and intensified for the location can provide multiple benefits (Schiere *et al*., 2006).

The importance of manure as a source of recycled nutrients has been recognized for millennia. The economic value of manure, though significant, has not overcome the convenience and relatively low cost of inorganic fertilizers, and the lower confidence farmers have in nutrient
supply from manure. Larger, more specialized livestock production operations that import nutrients from distant sources have resulted in greater nutrient concentration in localized areas. These factors have contributed to excessive manure (or total nutrient) application and subsequent degradation of water resources, which in turn has stimulated regulations (Jongbloed,1998 and ; Saam and Adsen, 2005).

1.1 Co-evolution of farming system in time and space

Mixed crop-livestock systems co-evolve in their context. This is due to the fact that farming systems are not static but they are constantly changing in time and space. When land is relatively abundant, crops and animals exist parallel to each other. In this case, crops and animals are complementary and do not exchange resources among them. As land becomes scarce, as a result of the success of this type of farming, the expanding farmer population is forced to keep animals together with crops. Higher exchange of resources like dung, crop residues and animal draft are then required. This therefore results to a mode of farming which is referred as the Integrated Low External Input Agriculture (ILEIA).Keeping of animals and crops will start to disintegrate as specialization begins to set in. This mode permits economies of scale, labour efficiency, and mechanization as well as inorganic inputs such as the chemical fertilizers. This mode of specialization eventually chocks itself or starves itself due to the negative impacts on the environment as well as the exhaustion of resources .This leads to re-integration of enterprises depending on the mind - set of the farmer (Herman and Schiere, 2008).

2.0METHODOLOGY

2.1 The study area

Elgeyo-Marakwet County is one of the counties in the former Rift Valley province. The county is located along the basin of the Kerio River in the Rift Valley Province of Kenya. It borders Uasin Gishu County in the west, Baringo and Pokot Counties in the east, and Turkana County in the north. The county can be divided into three agro-ecological zones: highlands in the west, escarpment in the central parts, and the valley floor. This study focused on the highlands community. The Valley floor is flat and dry with sandy soils, ideal for staple and drought-resistant crops; livestock graze freely in open areas. In the highlands (Upper valley), homesteads are located on relatively flat to moderately sloped land with sandy and clay soils; horticulture is currently practiced in this region. Escarpment is very steep, but staple or drought-resistant crops are cultivated.

The highland areas include; Iten, Kaptarakwa, Kaptagat, Chepkorio, Nyaru, Flax, Metkei and Cherangany. The valley floor forms the low lands. The areas on the valley floor include, Cheptebo and Fluorspar, Kimwarer and Tot. (Government of Kenya, 2008)

Elgeyo-Marakwet County experiences a bimodal rain pattern with its long rain starting from late March up to early July. The short rains experienced in the area start from September to November. The major farming activities in the low lands include livestock keeping (indigenous goats and cows) and fruit farming. The kinds of fruits farmed include paw paws, mangoes and oranges. The communities that live on the escarpment on the central part practice mainly maize and bean farming although characterized mainly by small-scale production. On the other hand the major farming activities in the highlands include dairy farming, tea production, vegetable growing, sheep farming and maize farming. Cereals, particularly maize, are the major crops grown by smallholder farmers in the region. The integration of other crops including legumes has been systematic following calls for crop diversification by agricultural extension workers. Cereal residues make up part animal feed, in combination with roughage from natural pastures. Grazing of crop fields takes place after harvesting rain fed crops, usually at the end of the rainy season (around December)

2.2 Analytical framework

2.2.1Hard system methodologies (HSM) versus the Soft System Methodologies (SSM)

There are three strongly related and complementary approaches that are used in farm system thinking and analysis; hard, soft and complex system thinking. HSM is predominant among technically oriented people .This system focuses on quantifications while at the same time assuming clear and strict boundaries of interaction among enterprises in the farm. SSM focuses on the issues of motivation, learning, relations, mind-set and empowerment. SSM stresses on multiple inputs, perceptions, outputs and relation to the environment. In this system, most if not all problems can be perceived differently by different stakeholders. The soft SSM assumes the following:

a) Different vague and qualitative but real human interactions play a role in the farming process.
b) The opinion of one individual affects the opinion of someone else.
c) Different perceptions occur.

Goals and opinions change continuously. A combination of HSM and SSM yields Complex System Methodology (CSM) whose focus is on variation and uncertainty. (Schiere *et al.,* 2006). Therefore this study employed the complex system thinking.

3. RESULTS AND DISCUSSIONS

3.1 Characterization of dairy-crop integrators and non integrators

The major characteristics of interest that were put into focus in this objective include the years of schooling of both integrators and non integrators as well as their ability to access credit facilities from both formal and informal organizations. The formal organizations that provide credit to both dairy-crop Integrators and non integrators included banks and micro- finance organizations. Co-operative organizations also formed an important source of formal credit. In addition to, the size of land of land owned by the famer was used to characterize dairy-crop integrators and non integrators.

a) Years of schooling

The mean years of schooling for both dairy-crop integrators and non integrators were not the same (table 1). The integrators had a lower mean in years of schooling of 8.87 as compared to that of non integrators who had a higher mean of 10 years of schooling

The two tailed t -test in table 2 shows that the significance level (0.067) is greater than confidence interval (0.05). This reinforces the fact that there is a significant difference in the mean number of years of schooling of integrators and non-integrators.

More non integrators (43.5%) as opposed to integrators (41.2%), reported to have off farm income from business activities such as such as shops, flour mills, transport business or other employments in the public and private sectors of the economy. This further underpins the argument that non integrators had more years of schooling than integrators and this could have exposed them to additional business skills. It seems therefore that because non integrators do not have other skills, they have attempted to concentrate the knowledge they have on farming by embracing such activities as integration.

b) House hold size

Integrators had a higher household mean unlike the non integrators .The mean size of households for dairy-crop integrators was 6.49 persons as opposed to 4.98 for non integrators (table 3). The higher household mean for integrators can be translated to mean integrators have a higher supply of family labour and will tend to put it into enterprise integration given that integration is a labour intensive activity. The opposite is true to non integrators.

A two tailed t-test results shows that there is significant difference (p=0.05) in the mean household size of integrators and non integrators (table 4).

c) Procurement of credit.

Results in Table 5 show that only 34.1 % of dairy-crop integrators in Elgeyo Marakwet County seek credit for agricultural purposes .On the other hand, 40% of non-integrators strive to seek credit Therefore; more non-integrators are credit seekers as opposed to integrators. The high number of credit seeking by non integrators can be attributed to the higher mean in years of schooling, meaning that they have access to more information on matters relating to credit as opposed to integrators. Access to information gives the non integrators the ability to haggle for and solicit credit from diverse sources while their counterparts may be suffering from fear of the unknown. But in order to improve and even modernize integration, the integrating households must embrace the use of agricultural credit.

The trend depicted by results in Table 6 reinforces the level of exposure of the two groups. Integrators are more inclined towards micro-finance (38%) and informal institutions (28%). This is probably because of their proximity and the less formal nature of these providers. They seemed not to prefer bank credit possibly because of the distance and the stringent bank procedures unfamiliar to them. The non integrators on the other hand, as a result of more exposure, utilized credit from banks, co-operatives and microfinance but not from informal sources.

d) Land size

Results presented in Table 7 show that integrators had a larger size of land (5.25 acres) on average as compared to non integrators (3.55 acres).

The independent t-test results in table 8 give a clear indication that there is a significant difference in the mean land size owned by both integrators and non-integrators. It can, therefore, be implied that farmers with smaller land sizes do not integrate dairy and crop enterprises. This finding is surprising because it was expected that as farms become smaller, they should tend towards integration, which is a form of diversification. This finding is inconsistent with the findings of Devendra, (2002) who found that as the land resource becomes scarce, involution occurs and farmers tend to integrate enterprises instead of specializing.

Therefore, there is significant difference in the characteristics of dairy- crop integrators and non integrators as depicted by findings of the study because integrators have a lower mean in the years of schooling as opposed to non integrators. Furthermore, the non integrators had smaller households and land sizes as compared to the integrators. In addition more non integrators were credit seekers unlike the integrators.

4.CONCLUSION

Farm and farmer characteristics of integrators and non integrators are not the same and are important in depicting the decision to adopt a new technology in terms of age, education, household size, and off farm employment.

Integration is a labour demanding activity. This is depicted by the fact that integrators had a high mean number of household members as opposed to non integrators.

5. RECOMMENDATIONS

Farmers in the low education category were found to be engaging dairy-crop integration, their. Low education status has a negative implication on the effectiveness and innovations on their value integration activities. There is therefore need for policies to address the limitation of such a category, through targeted training programs that will enhance the knowledge gap of such farmers on better integration activities.

Policies that encourage dairy-crop integration should be encouraged in order to improve the farmers' welfare since it a form of farm diversification as well as way adding value to farm by-products such as animal droppings, crop residues and weeds from the crop fields.

TABLES

Table 1: Years of schooling of dairy- crop integrators and non integrators

Type of farmer	Mean yrs of schooling	No. of observations	Std. Deviation
Dairy-crop integrator	8.87	85	3.851
Non integrator of Dairy and crops	10.00	85	4.132
Total	9.44	170	4.022

Table 2: Independent sample t- tests for the level of education of farmers

	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Education level of farmer	-1.844	168	**0.067**	-1.13	0.613	-2.339	0.080

Table 3: Household size

Type of farmer	Mean HH size	No. of observations	Std. Deviation
Dairy-crop integrator	6.49	85	2.693
Non integrator of Dairy and crops	4.98	85	1.566
Total	5.74	170	2.324

Table 4: independent sample t- test for the household size among integrators and non integrators

	t-test for Equality of Means						
	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Household size	4.491	168	0.07	-1.52	0.338	0.851	2.185

Table 5: Procurement of credits by integrators and non integrators

	Integrators		Non integrators	
	Frequency	**Percent**	**Frequency**	**Percent**
Credit seekers	29	34.1	34	40.0
Non Credit seekers	56	65.9	51	60.0
Total	85	100.0	85	100.0

Table 6: Credit providing organization for dairy crop integrators

	Integrators	Non-integrators
Credit providing organization	**Percent**	**Percent**
Banks	17	38
Co-operative organizations	17	26.5
Micro-finance institutions	38	26.5
Informal organizations	28	9
Total	100	100

Table 7: Mean size of land owned by integrators and non integrators of dairy and crops

	Integrators	Non-integrators
Mean size of land owned	5.25 (acres)	3.55 (acres)

Table 8: independent sample t-test for land size owned by integrators and non integrators

	t-test for Equality of Means						
	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Acres of land owned	2.76	168	0.06	1.71	0.62	0.48	2.93

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