Effects of Integrated Cassava Value Chain Intervention on Socio Economic Development of Smallholder Farmers in Rongo District Kenya.

Raphael Mwiti Gikunda
Chuka University

Godffrey Nyongesa Nato
Technical University of Mombasa

Samuel Obino Mokaya
Jomo Kenyatta University of Agriculture and Technology Kenya

Abstract
Value chain development has become a key approach in both research and policy fields, with an increasing number of bilateral and multilateral aid organizations adopting it to guide their development interventions. AICAD/JICA-Project supported by the three East African States of Kenya, Uganda and Tanzania together with Japan International Cooperation Agency, adopted this approach to improve the livelihoods of the farming communities living in Rongo District of Migori County. The communities used to grow a lot of cassava which was however, wiped out by African Cassava Mosaic Disease in 1980s. Although, farmers resorted to maize and sugarcane farming, the yields were low due to the poor soils, lack of finances to purchase adequate farm inputs and presence of striga weed; a parasitic plant that has devastating effect on the yield of cereal crops. The project was aimed at re-introducing cassava crop in the District and empowering the community on how to produce, process, utilize and market its products for poverty alleviation and socio-economic development. The study, was conducted to assess the effects of the project intervention on the socio-economic development of the farmers, involved a sample of 40 beneficiaries obtained through stratified proportionate random sampling. Descriptive and inferential statistical tools were used to analyze the collected data with the aid of SPSS computer programme. The results show that besides a significant increase in the average acreage under cassava (from 0.4 acres to 0.98), the production, processing and marketing interventions had a positive and significant effects on the socioeconomic indicators among the small holders farmers.

Key Words: value chain interventions, socio-economic impact, livelihood, disease resistant cassava, smallholder.

Introduction

Value chain interventions have become increasingly popular as a development tool. In recent years, a range of organizations are employing value chain tools includes donors such as the Deutsche Gesellschaft für Technische Zusammenarbit (GTZ) and the United States Agency for International Development (USAID). According to Ruijter, Elliott, & Hitchings (2006), a value chain describes the full range of activities required to bring a product from conception to its end use and beyond. This includes activities such as design, production, marketing, distribution and support to the final consumer. Henriksen *et al* (2010) contends that value chain development has become a key approach in both research and policy fields, with an increasing number of bilateral and multilateral aid organizations adopting it to guide their development interventions.

Cassava represents a major food crop in Africa where it provides a livelihood for millions of smallholders. In developed countries, cassava is mainly imported to manufacture animal feed and starch. For instance, Thailand grows cassava primarily for export to European markets for animal feed manufacture. In Africa, about 70% of cassava is produced for human consumption (CIAT, 2002). In West Africa, cassava is mainly consumed as *gari*. This accounts for about 70% of cassava consumption in Nigeria, 40% in Ghana and 30% in the Ivory Coast (Dorosh, 1989). Cassava is grown virtually throughout Kenya. However, the Western, Coastal and semi-arid (Eastern) regions of Kenya have the highest production in that order (Njeru and Munga, 2003). Cassava (*Manihot esculenta Crantz*) is second only to maize in importance in western and coastal regions of Kenya. The country produces 600,000 MT annually with farmers realizing yield between 7-9 MT/Ha (FAO, 2004). Nangayo *et al*., (2007) indicate that major studies conducted on cassava at the end of the 20th century have predicted the growing importance of this crop in Africa's economic development.

Communities living in Rongo District of Migori County used to grow a lot of cassava. However, it was wiped out by African Cassava Mosaic Disease (ACMD) between 1984 and 1990 (Thresh, et al., 1997). Farmers resorted to maize and sugarcane farming for their livelihoods. However, due to the poor soils and lack of resources to purchase fertilizers, the maize yields have never been impressive. This is compounded by the presence of striga weed in the area, a parasitic plant that has devastating effect on the yield of cereal crops. Consequently, proceeds from sugarcane are relatively low and intermittent. It is due to these challenges that AICAD initiated and implemented a project between 2007 and 2012 to restore cassava production in the District.

The project aimed at empowering the community to produce, process, utilize and market the crop as well as its products for poverty alleviation and socio-economic development. Two selected TMS varieties (MM95/0193 and MH95/0183) that are of high yielding and adaptable to the local conditions were acquired from Agricultural Training Centre in Kisii in 2010 screened and bulked. The cassava cuttings were distributed after Ten months to farmers in the District. The farmers were empowered at various stages of the cassava value chain ranging from production, post harvest, processing, utilization and marketing through training programmes, demonstrations, field days, exhibitions and market survey. The study therefore aimed at establishing the socioeconomic impact of the crop's value chain interventions.

Study Area

The survey was conducted in Rongo District of Migori County in western province. It involved 40 cassava farmers, who benefited from the interventions, spread within four administrative locations namely West Kamagambo, East Kamagambo, North Sakwa and West Sakwa.

Methods and methods

The study adopted a survey research design. The sample of 40 small scale farmers was selected from four administrative locations of Rongo District through stratified proportionate random sampling. The survey employed a structured questionnaire which captured information relating to farmer's characteristics, cassava production, income levels, processing, utilization, marketing and community empowerment in general. Descriptive and inferential statistical tools were used to analyze the collected data with the aid of Statistical Package for Social Sciences computer programme. The mean, frequencies and percentages were used to describe the variable characteristics while multiple regression was run to analyze the contribution of the interventions on the socioeconomic development in the area.

Results and Discusion

Demographic characteristics

The study involved a sample distribution of 53% female farmers and 47% male. This implies that more women are engaged in cassava production than men. Majority of the respondents (52%) were aged between 20 and 49 years. The mean family size was 9 persons per household. The distribution of the respondent by their literacy status shows that 78% of the respondents had attained primary education, 20% had attained secondary education and 2% had attained college education. The average land size per farmer was 5.181 acres, meaning that all the farmers had adequate land to expand the production of the crop.

Adoption of Cassava Value Chain Technologies

The study sought to establish the level of adoption of appropriate cassava value chain technologies among the beneficiaries. According to the results in Table 1, 83% of the respondents had cultivated cassava crop in less than half an acre before the implementation of the project while 65% had cultivated the crop in a piece of land, between 1 and 3 acres after its implementation. The average acreage under cassava crop increased from 0.4 acres before the project to 0.98 after its implementation.

Table 1: Land under cassava crop

Land Size (acres)	Land under cassava crop (before project)		Land under cassava crop (now)	
	Frequency	percent	Frequency	percent
0.000	7	17.5	1	2.5
0.125	4	10.0	0	0
0.250	12	30.0	3	7.5
0.500	10	25.0	10	25.0
1.000	6	15.0	19	47.5
1.500	1	2.5	2	5.0
2.000	0	0	3	7.5
2.500	0	0	1	2.5
3.000	0	0	1	2.5
Total	40	100.0	40	100.0

Mean acreage =0.4000 *mean acreage =0 .98125*

Application of Farming Systems

The production interventions which were exposed to farmers include crop rotation and appropriate agronomic practices such as timely land preparation, planting recommended cultivars, weeding and pest control practices. The findings are presented in Table 2. According to the results crop rotation was being practiced by 70% of the respondents (before the project) as compared to 80% who are currently practicing it. Only 15% of the respondents were practicing mono cropping before implementation of the project as compared to the current 80%. Agro forestry was being practiced by 18% of the respondents as compared to current 55%. Only 13% of the respondents were practicing organic farming before project as compared to 53% who are practicing it at present. Generally, the number of farmers applying appropriate farming systems has been on the increase since the initiation of the project.

Table 2: Application of the recommended farming systems

Before implementation				
Farming Systems	Farmers practicing		Farmers not practicing	
	Frequency	Percent	Frequency	Percent
Crop rotation	28	70.0	12	30.0
Mono cropping	6	15.0	34	85.0
Agro forestry	7	17.5	33	82.5
Organic farming	5	12.5	35	87.5
After implementation				
Crop rotation	32	80.0	8	20.0
Mono cropping	32	80.0	8	20.0
Agro forestry	22	55.0	18	45.0
Organic farming	21	52.5	19	47.5

Application of Recommended Agronomic Practices

The application of recommended agronomic practices was also assessed. According to the results in Table 3, the number of farmers practicing timely land preparation increased from 45% before the project was implemented to 88% after implementation, those practicing timely planting increased from 38% to 95%, those using recommended planting material rose from 28% to 98%, those applying timely weeding increased from 20% to 100% and those practicing timely disease & pest control increased from 28% to 98%. This shows that there was a general improvement in the application of the recommended practices as a result of the implementation of the project.

Table 3: Application of recommended agronomic practices

Before implementation				
Agronomic practices	Farmers practicing		Farmers not practicing	
	Frequency	Percent	Frequency	Percent
Timely land preparation	18	45.0	22	55.0
Timely planting	15	37.5	25	62.5
Recommended planting material	11	27.5	29	72.5
Timely weeding	8	20.0	32	80.0
Timely disease & pest control	11	27.5	29	72.5
After implementation				
Timely land preparation	35	87.5	5	12.5
Timely planting	38	95.0	2	5.0
Recommended planting material	39	97.5	1	2.5
Timely weeding	40	100.0	0	0
Timely disease & pest control	39	97.5	1	2.5

Application of Processing Technologies

When asked to indicate whether they were processing cassava into various products, 12% indicated they were not while 88% were processing as shown in Figure 1. This shows that majority of the respondents were already practicing the processing technologies they had been trained on.

Cassava Processed Products

The respondents were further asked to indicate the products they were processing the cassava into. As illustrated in Figure 1, 95% were processing cassava tubers into cassava flour, 43% were processing the cassava into cakes, 30% were processing their cassava into crisps, 40% were processing their cassava into scones and 20% were processing their cassava into bread. This implies that majority of the respondents were processing their cassava into cassava flour.

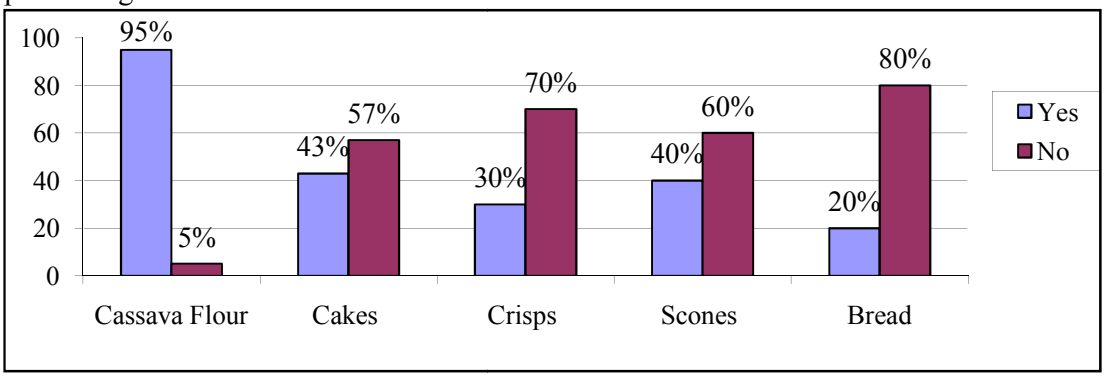

Figure 1: Processed cassava product

Packaging of Cassava Products

When asked to indicate whether they packaged their products after processing, 55% were packaging while 45% were not as shown in Figure 2. This shows that majority of the respondents had adopted the practice after they had been trained on the same.

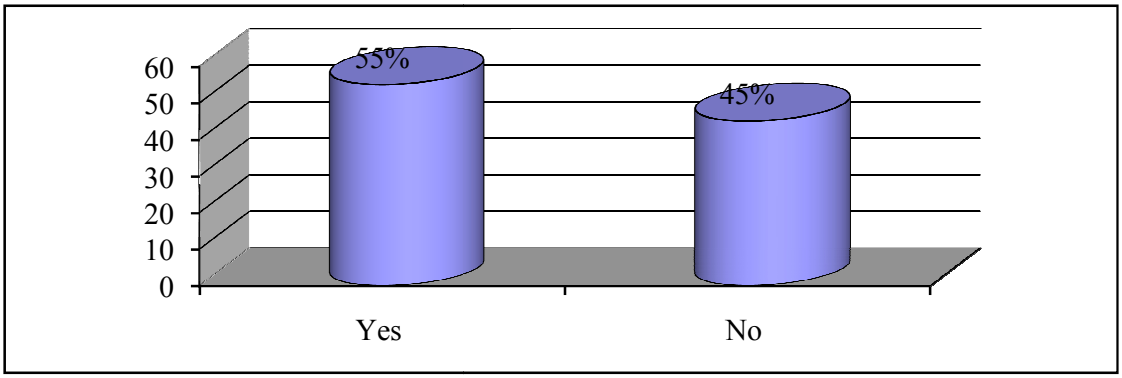

Figure 2: Percentage of farmers packaging the cassava processed products

Application of Marketing Technologies

The target farmers had been trained on market technologies and thus the survey sought to establish the level of adoption of these technologies. Among the technologies that they had been trained on were conducting a market survey and exhibition.

Market Survey

The respondents were asked to indicate whether they had conducted market surveys after being trained on how to undertake the exercise. Seventy five percent confirmed that they had conducted market surveys for their cassava products while twenty five did not as illustrated in Figure 4. This shows that the level of application of the technology was high.

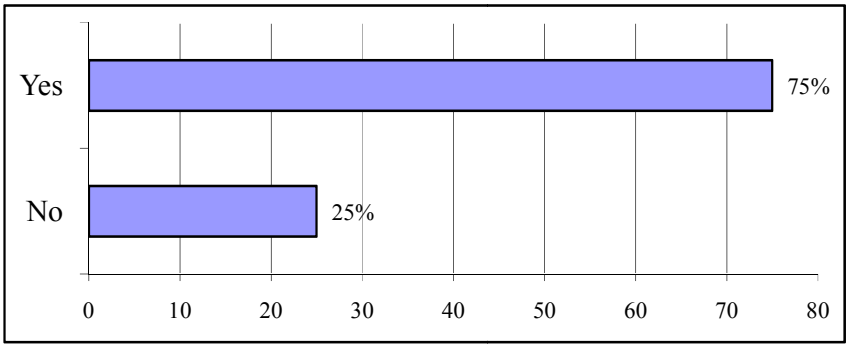

Figure 3: Percentage of farmers conducting market survey for cassava products

The usefulness of the market survey (identification) was also evaluated. The results indicate that 3% of the respondents felt that market survey was most useful, 27% of the indicated that the survey was useful and 70% stated that it was least useful as illustrated in Figure 4. This shows that majority of the farmers considered market survey least useful owing to the fact that they have not been able to produce enough to satisfy the demand of the local markets before reaching out other markets.

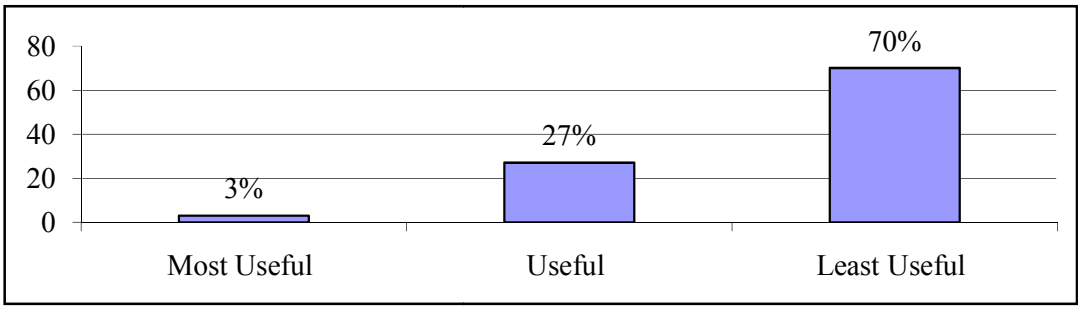

Figure 4: Usefulness of market identification

Market Demand

The respondents were also asked to indicate whether the cassava products they supplied to the market were able to satisfy the available demand. It emerged from the results that only 43% felt that their supplies satisfied their customers' demand as depicted in Figure 5. This implies that majority of the farmers hence there is need to improve cassava production.

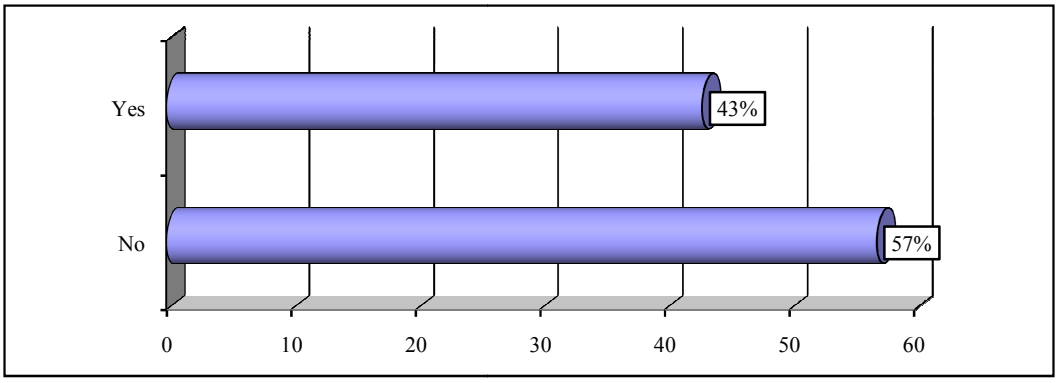

Figure 5: Percentage of farmers satisfying their customers' demand

Exhibition

An exhibition was conducted towards the end of the project to launch the cassava products in the target area. Therefore, the survey evaluated its usefulness. According to the in Figure 6, only 5% of the respondents felt that the exhibition was least useful, 33% indicated that the launch was useful and 62% stated that the launch was most useful. This show that majority of the respondents felt that the launch was useful.

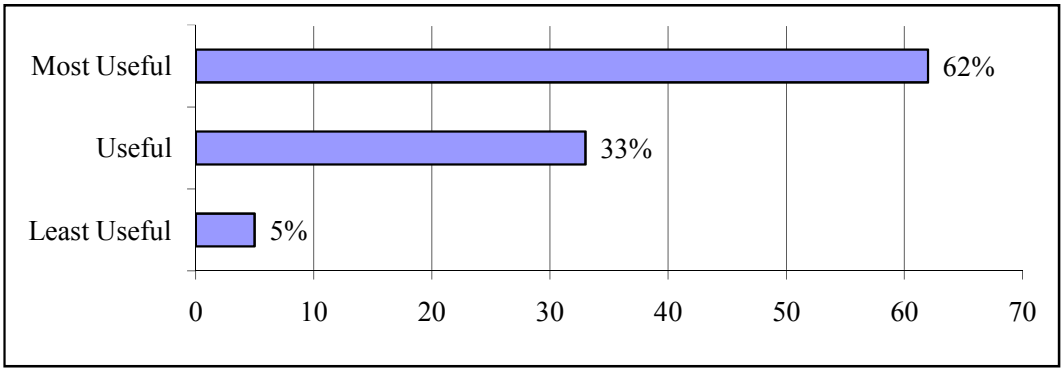

Figure 6: Usefulness of the market launch

3.3 Impact of the Project on the Income Levels

Regarding the socioeconomic impact of the project, the survey looked at cassava yields and the seasonal comparative income before and after the project.

Cassava Yields per Season

The respondents were asked to indicate their yields in bags per season before and after implementation of the project. The results in Table 4 indicate that majority (90%) of the farmers were producing less that 10 bags a season before the project as compared to the current production of over 10 bags per season by 69% of the farmers. This shows that there has been a tremendous increase in cassava production as a result of the project. This is further supported by an increase in the average yields from 4.3 bags per farmer in one season before the project to 16.5 bags per farmer in one season currently. This can be attributed to continuous application of the recommended agronomic technologies.

Table 4: Cassava yeild per season

	Before the project		After the project	
Cassava yield per season (bags)	Frequency	%	Frequency	%
Less than 10	36	90	16	40
10 - 20 bags	4	10	15	37.5
21 - 30	0	0	8	20
Over 30	0	0	1	2.5
Total	40	100	40	100

Average cassava yields per farmers before the project = 4.275 bags, Average cassavayeilds per farmer after the project per farmer = 16.475 bags

Income per Season

An assessment of the changes in income levels revealed that majority (83%) of the project beneficiaries were earning less than Kshs 10, 000 from the cassava crop as compared to current income of over Kshs

10,000 earned most (85%) of the farmers as shown in Table 9. The mean income per farmer in a season had increased from Kshs 5,760 before the project to Kshs 31,475 after implementation. This shows an incredible increase in income which can be attributed to the increased production.

Table 5: Income per season

	Before the project		After the project	
Income per season	Frq	%	Frq	%
Less than 10,000	33	82.5	6	15
10,001 - 20,000	7	17.5	11	27.5
20,001 - 30,000	0	0	5	12.5
30,001 - 40,000	0	0	3	7.5
40,001 - 50,000	0	0	9	22.5
Over 50,000	0	0	6	15
Total	40	100	40	100

Mean income per season before the project = Kshs 5,760. Mean income per season after the project = Kshs 31,475

Food Security

When asked to indicate the level in which they agreed with the opinion that the community was now food secure as a result of increased cassava production attributable to the project, majority of the respodents (97%) confirmed that the increased production had boosted the food security status. Figure 12 illustrates the percentage of respodents who confirmed that the project had impacted positively on the food security status in the community.

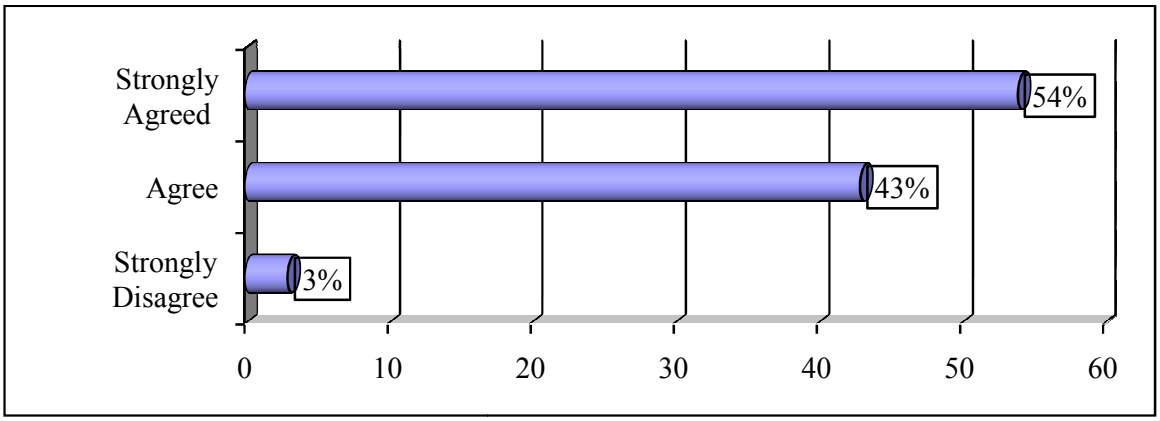

Figure 7: Food security issue

3.4 Social Empowerment

The third objective sought to determine the effects of the Project on social empowerment of farmers in Rongo model region. The survey mainly focused on the group formation, participation in communal activities as well as the benefits.

Participation in Group Activities

When asked to indicate whether their participation in the project activities increased or decreased since the beggining of the project, majority (90%) of the respodents confirmed that their participation had increased while 10% stated that it had declined as illustrated in Figure 9. When asked to indicate what led to the

decline, the respodents mentioned that cause was associated with problems in the management of their groups.

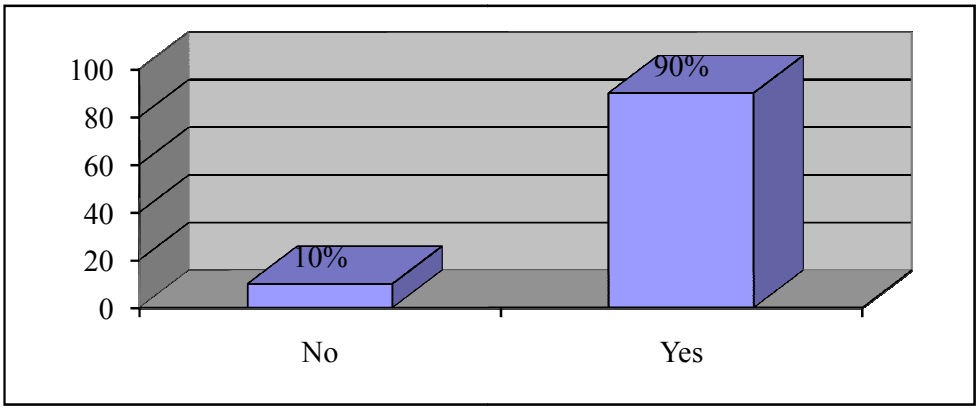

Figure 8: Participation in project activities

Solidarity in Groups

The respondents were further asked to rate the level of solidarity in the groups. The results indicate that most of the respondents (97%) rated it as being strong while 3% rated it weak as presented in Figure 10. This implies that members of the groups supported one another in times of need.

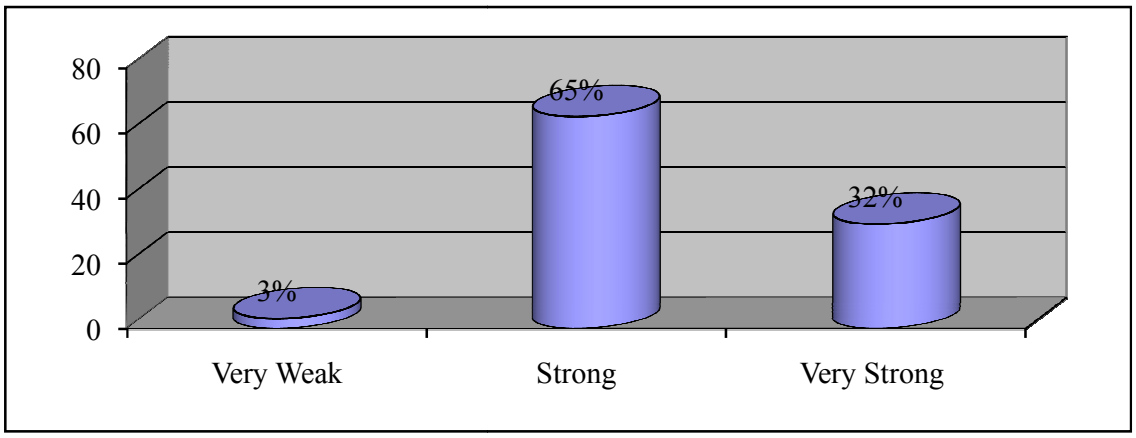

Figure 9: Level of solidarity in groups

The respodents were further requested to indicate their levels of agreement with a set of statement regarding social empowerment. According to the results in Table 6, Participation in communal activities had increased since the beginning of the project as noted by 97%. It also emerged that the cassava project had led to strong solidarity among members in the community as stated by 97%. The results further indicate that the increased social cohesion among members of the community is attributed to adoption of lessons learnt from the cassava project. All the mean scores were above 3.0 meaning that majority of the respodents agreed with the statements.

Table 6: Social capital

Statement/ item	Strongly Disagree		Disagree		Agree		Strongly Agree		Mean
	Fq	%	Fq	%	Fq	%	Fq	%	
Participation in communal activities has increased since the beginning of the project	1	2.5	0	0	17	42.5	22	55.0	3.50
The Cassava Project has led to strong solidarity among members in the community	1	2.5	0	0	16	40	23	57.5	3.53
The increased social cohesion among members of the community is attributed to adoption of lessons learnt from the cassava project	1	2.5	0	0	19	47.5	20	50.0	3.45

Contribution of Value Chain Interventions to Socioeconomic Development

The study had hypothesized that production; processing and marketing cassava interventions are capable of propelling socioeconomic development in Rongo District.

Regression Analysis

Regression analysis was run to determine how each independent variable (production intervention, processing interventions, and marketing interventions) affects the dependent variable (socio economic development).

The regression model is summarized as;

$Y = B_1 + x_1(PI) + x_2(PRI) + x_3(MI)$

Where; Y is Socioeconomic development, PI is production interventions, PRI is processing intervention, and MI is marketing interventions. B_1 is Alpha while x_1, x_2 and x_3 are constants.

According to study findings in Table 7, cassava production; processing and marketing cassava interventions accounts for 63% (R-Square, 0.629) of variation in socioeconomic development in Rongo District. The estimation of socioeconomic development using this model had an error margin of 0.4517%.

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.793(a)	0.629	0.598	0.4517

Predictors: (constant) Production intervention, processing interventions, marketing interventions

The findings (Table 8) further indicate that an increase in score by one unit of production, processing and marketing interventions would increase socioeconomic development by 0.535, 0.457 and 0.374 respectively. This shows that production interventions contributed most, followed by processing and the least contributor in the socioeconomic development were marketing interventions. It is also important to note that all the independent variables have positive effects on dependent variable.

Table 8: Regression coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	B	Std. Error	Beta		
(Constant)	-2.774	.930		-2.983	.005
Production intervention	.535	.101	.583	5.292	.000
Processing interventions	.457	.088	.543	5.174	.000
Marketing interventions	.374	.157	.271	2.390	.022

Dependent Variable: Socioeconomic Development

The regression model is hence summarized as;
Y = -2.774 + (0.535*PI) + (0.457*PRI) + (0.374*MI), Where; Y is Socioeconomic development, PI is production interventions, PRI is processing intervention, and MI is marketing interventions.

Conclusion

The project introduced a high yielding cassava and disease resistant variety to the farmers for adoption and multiplication. This has led to increased total yield per acre of cassava and thus more income for the farmers. The farmers now benefit qualitatively and quantitatively from the improved varieties. The improved variety has also enabled the farmers to make more money from stem sales to other farmers. The best agronomic practices which farmers under the project were exposed to, have really placed them above their contemporaries, specifically in the areas of farm management practices, quality of roots, higher competition in terms of market prices for roots. It therefore means that knowledge was gained by farmers and their incomes are steadily improving.

The project has introduced better techniques of cassava processing which has led to appreciable reduction in production cost. The new cassava processing techniques has indeed brought about improved quality of product, increased products' commercial competitiveness and higher income for the beneficiaries. The beneficiaries have attested to this fact and are daily, reaping the advantages of the project.

The social empowerment on the other hand has also been improved following the interventions. This has been characterized by increased participation in community activities over the period, occasioned by increased frequency in participation in group activities, increased number of groups, increased solidarity and strong ownership of the project. The increased participation in communal activities was as result of strong solidarity (togetherness), easier problem solving, invaluable benefits and empowerment by AICAD and other stakeholders. It is evident from the study findings that value chain interventions contributed positively to socioeconomic development in the area. Out of three categories of interventions, production interventions contributed most, followed by processing and the least contributor in the socioeconomic development were marketing interventions.

Recommendations

Based on the findings of the survey the following recommendations were made;
There is need for the donor agencies and other stakeholders committed in the eradication of poverty in the area to support the improvement in the quality, availability and accessibility of financial services and the

development of modern financial institutions and sustainable microfinance operations. This will boost access to financial services and hence an expansion of cassava production, processing and marketing.

The survey recommends that donor agencies should establish a link between the cassava processing machine fabricators and the farmers to ensure that enable them access the machines and after sale services when need arises.

Although most farmers in the model region consider farming as a business, emphasis should be put towards encouraging the farmers to keep records in order to monitor the progress of their enterprises. This will enable the farmers determine what, when and how to produce.

There is need for the donor agencies to replicate the project in other areas with similar climatic conditions as Rongo to ensure that more people in the country are food secure and also to uplift their living standards.

References

Centro Internacional de Agricultura Tropical (CIAT) (2002): Adding Value to Root and Tuber Crops. A Manual on Product Development. Colombia: Centro Internacional de Agricultura Tropical.

Dorosh, P. (1989): Economics of Cassava in Africa. In: Sarma, J.S. (Ed.) (1989): Summary Proceedings of a Workshop on Trends and Prospects of Cassava in the Third World. Washington: IFPRI.

FAO. (2004). FAO online statistical database. Rome, Italy (www.fao.org)

Henriksen L.F., Riisgaard L., Ponte S., Hartwich F., Kormawa P. (2010) Agro-Food Value Chain Interventions in Asia. A review and analysis of case studies. *Working Paper* December 2010. IFAD.

Nang'ayo, F., Omanya, G., Bokanga, M., Odera, M., Muchiri, N., Ali, Z., and Werehire, P. (eds). 2007. A strategy for industrialization of cassava in Africa: *Proceedings of a small group meeting 14-18 Nov, 2005*. Ibadan, Nigeria. Nairobi, Kenya

Njeru R.W. and T.L. Munga. (2003). Current status of Cassava Brown Streak Disease in Kenya. *In* Legg J.P and Hillocks, R.J. (eds) Cassava Brown Streak Virus Disease: Past, Present and Future. *Proceedings of an international workshop*,Mombasa Kenya, 27-30 October 2002. p12-13. Natural Resources International, Aylesford

Ruijter de Wildt M., Elliott D., and Hitchins R., (2006) *Making Markets Work for the Poor: Comparative Approaches to Private Sector Development*, Berne: Swill Agency for Development and Cooperation.

Thresh J.M., Otim-Nape G.W., Legg J.P. and Fargette D. (1997). African Cassava Mosaic Disease; Magnitude of the problem. *African Journal of Root and Tuber Crops.* 2, 13-18.