EGERTON UNIVERSITY

TEGEMEO INSTITUTE OF AGRICULTURAL
POLICY AND DEVELOPMENT

WPS 38/2010

IMPACTS OF USAID/KENYA SUPPORTED AGRICULTURAL PRODUCTIVITY INTERVENTIONS ON HOUSEHOLD INCOME AND POVERTY REDUCTION

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Tegemeo Institute

Tegemeo Institute of Agricultural Policy and Development is a Policy Research Institute under Egerton University with a mandate to undertake empirical research and analysis on contemporary economic and agricultural policy issues in Kenya. The institute is widely recognized as a centre of excellence in policy analysis on the topical agricultural issues of the day, and in its wide dissemination of findings to government and other key stakeholders with a view to influencing policy direction and the decision making process. Tegemeo's empirically based analytical work, and its objective stance in reporting and disseminating findings has over the past decade won the acceptance of government, the private sector, civil society, academia and others interested in the performance of Kenya's agricultural sector.

Published 2010

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Tegemeo Institute acknowledges the support for its research programmes from key Partners including the United States Agency for International Development (USAID), Michigan State University (MSU), and Egerton University, Njoro Kenya. Others include the World Bank, European Union, Department for International Development (DFID), Food and Agriculture Organization of the United Nations (FAO).

Executive Summary

Agriculture is receiving increased importance in the development agenda following the food price and financial challenges of 2008 and the renewed emphasis on Millennium Development Goal (MDG) targets of halving poverty and hunger by 2015. In June 2009, President Obama committed the United States Government (USG) to increasing support to achieve MDG targets in regions with significant poverty and hunger. Africa and African agriculture are emphasized because of Africa's high rural poverty rates. Meeting MDG targets for sub-Saharan Africa requires significantly increased resources. Commensurate with these funding levels are increased needs to quantify and document the impact of USG-funded interventions on poverty reduction.

This paper presents the results of an impact assessment of three USAID/Kenya supported interventions to reduce poverty in Africa: the Kenya Dairy Development Program (KDDP), Kenya Maize Development Program (KMDP) and Kenya Horticultural Development Program (KHDP).

The analysis is based on Tegemeo Institute's longitudinal data set specifically capturing the impact of USAID programs. The sample was divided into three farm household groups (HHGs): those participating in programs ("direct treatment group"); those not directly participating in programs but residing in villages where programs were operating ("indirect treatment group") and those households residing in villages where no USAID programs were operating ("control group") (Figure ES).

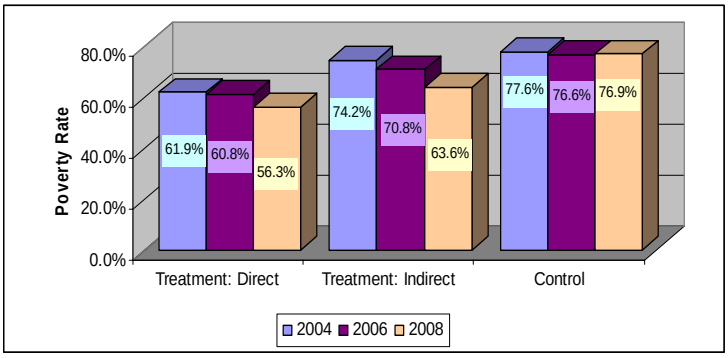

Figure ES. Poverty Rates in Treatment and Control Groups, 2004, 2006 and 2008. Source: authors' calculations from USAID/Tegemeo data.

Between 2004 and 2008, net poverty in the direct treatment group decreased by 4.9 percentage points, a decline attributable to the USAID programs. Among indirect beneficiaries of the programs, a net poverty rate reduction of 9.9 points is attributable to the USAID/Kenya supported interventions. Between 2006 and 2008, poverty among female-headed households potentially benefitting from the USAID programs declined from 76% to 67%.

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Acronyms

DiD	Difference-in-Difference
KDDP	Kenya Dairy Development Program
KHDP	Kenya Horticulture Development Program
KMDP	Kenya Maize Development Program
KSH	Kenya Shillings
HHG	Household Group
MDG	Millennium Development Goal
USAID	United States Agency for International Development
US	United States
USG	United States Government

1.0 Introduction

Agriculture is receiving increased importance in the development agenda following the food price and financial challenges of 2008 and the renewed emphasis on achieving Millennium Development Goal (MDG) targets of cutting poverty and hunger in half by 2015. In June, 2009 President Obama committed the United States Government (USG) to increasing its level of support to achieve MDG targets in those areas of the world with significant poverty and hunger. A particular emphasis is on Africa and African agriculture because of Africa's high rural poverty rates. Meeting MDG targets for sub-Saharan Africa requires significantly increased resources. Commensurate with these funding levels are increased needs to quantify and document the impact of USG-funded interventions on poverty reduction.

This paper presents the results of an impact assessment of three USAID/Kenya supported interventions to reduce poverty in Africa: the Kenya Dairy Development Program (KDDP), Kenya Maize Development Program (KMDP) and Kenya Horticultural Development Program (KHDP). The next section of this paper briefly describes the programs. The third section examines the causal pathways from intervention to poverty reduction. Methodology and data are discussed in Section four while the fifth section presents the empirical results. The sixth section provides a more detailed examination of the cost-effectiveness of the KDDP in reducing poverty. Conclusions are drawn in the final section.

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1.1 The USAID/Kenya Supported Programs

Three USAID/Kenya Supported Programs are examined: the KDDP, the KHDP and the KMDP. These programs targeted increased productivity and linking smallholders to markets in Kenya's key staple crop, maize; in a key domestic and export sub-sector, horticulture; and in a growing domestic and intra-regional market, dairy. The intents of the programs were to increase on-farm productivity and market access, raising smallholder incomes and reducing poverty.

Land O'Lakes operated the KDDP in Kenya from September 2002 through April 2008 with expenditures of $10.2m.[1] This program targeted increased productivity and improved marketing in medium and high potential dairy areas. The interventions under KDDP were grouped into four strategic areas, namely; i) activities for enhancing dairy productivity; ii) policy advocacy activities; iii) dairy product quality and affordability activities; and iv) building capacity in the dairy industry. KDDP project targets related to productivity included increasing milk productivity from 8.6 liters/cow/day to 12.04 liters/cow/day, decreasing unit costs of production by 30%, and to introduce improved US bovine genetics to 87,000 farmers. Activities to increase productivity included the distribution of the improved genetics along with development of private-sector artificial insemination services, animal husbandry training, farmer use of software to manage feed rations, improved forage production technologies, dairy cooperative development, milk preservation (cold chain) innovations, and the training and certification of milk traders. The productivity and cost targets were not achieved. Actual productivity rose from 8.6 to 10.25 liters per cow per day. Unit costs were reduced by 16% rather than the envisaged 30%. These lower than expected outcomes were in part because 2008 was a drought year (2007 results were better). However, the program's impacts were still tangible and significant. The targets for distribution of US bovine genetics were exceeded, with 239,858 'straws' of genetics distributed to 91,549 farmers[1].

Fintrac operated the KHDP since its establishment in 2003, initially as a four year program but with extensions through March 2010. KHDP operates in the traditional horticultural production areas but targets smallholders on marginal lands who haven't previously received assistance (Figure 1). The programs' Kiswahili slogan translates to "increased incomes through better farming" [2]. Key strategic areas of intervention include i) sanitary and phyto-sanitary standards compliance; ii) domestic market growth; iii) product development; iv) development of Kenya-US trade in horticultural products; and v) intensification of tree crop production, particularly in Coast Province[3] . KHDP focus crops include passion fruit, chilies, vanilla, smallholder flowers, cashew, mango, and local market vegetables such as onions, carrots, cabbage, tomatoes and indigenous vegetables [4]. Production of the focus vegetables of cabbage and tomatoes

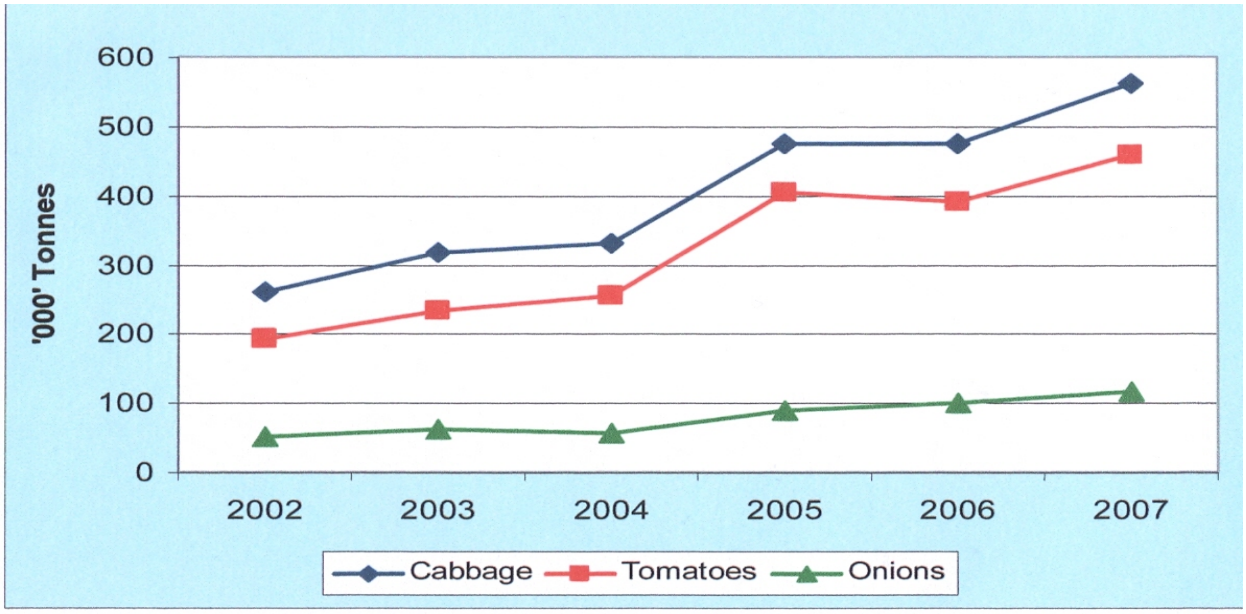
[1] In 2008 USAID/Kenya invested in the Kenya Dairy Sector Competitiveness Program , also operated by Land O'Lakes, as a follow-on to the KDDP.

doubled and onion production nearly doubled from 2002 to 2007 (Figure 2). Fintrac reports that as a result of the program, 58,000 individuals increased their incomes by an average of $340/year through 2009[3].

Figure 1: John Oneko's cabbage is ready to harvest. Oneko was displaced from Eldoret during the post-election chaos. He moved his family to Bungoma and leased a farm following interaction with USAID-KHDP beneficiaries

Source: Fintrac

Figure 2: Trends in National Production of Three KHDP's Focus Vegetable Crops—Cabbage, Tomato and Onion—2002 to 2007



Source: Fintrac

The KMDP was originally operated as a four-year program by ACDI/VOCA, now extended for its seventh year (2009) with a total budget of $11.2 m. KMDP strategies include increasing productivity, improving the effectiveness of smallholder organizations, and linking smallholders to markets. Specific activities include training on use of improved seed varieties, fertilizer, and conservation; training on marketing including warehousing (Figure 3); and working with input distributors to meet smallholder needs. ACDI/VOCA reports three- and four-fold increases in yields, from a baseline of 720kg/acre to 2880kg/acre in 2007 before dropping to 2350kg/acre in 2008 due in part to low rainfall and high fertilizer prices. The KMDP interventions have helped raise gross earnings by $557/household for 370,000 smallholders[5].

Figure 3: Outcomes of KMDP interventions. Left: maize ears ready for harvest. Right: warehousing of stored grain

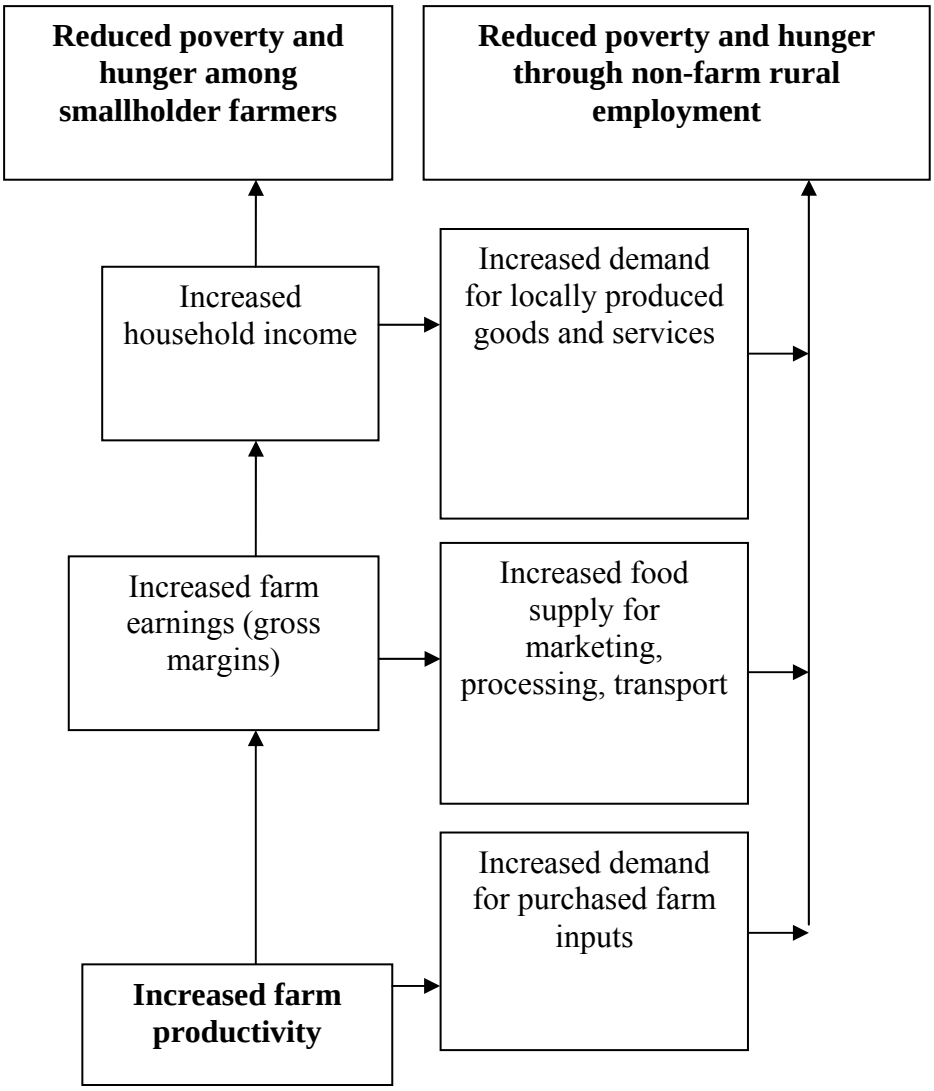
Source: ACDI/VOCA

1.2 Causal Pathways to Poverty Reduction

USAID/Kenya-supported interventions to increase agricultural productivity are expected to reduce poverty through two causal pathways. The first causal pathway applies to households that are directly targeted by the USAID/Kenya-supported interventions—the households that are the recipients of improved technologies such as the KDDP's improved bovine genetics, the KMDP's and KHDP's improved varieties, training, etc. These interventions are expected to raise household agricultural productivity, which in turn raises farm earnings and household incomes (Figure 4). The higher incomes are expected to reduce poverty.

The second causal pathway operates through non-farm rural employment and business opportunities. Higher agricultural productivity increases the demands for agricultural inputs, including labor. Higher agricultural incomes are spent in part on locally produced goods and services. These effects generate business and employment opportunities. The literature indicates that due to multiplier effects, the income-generating effect of non-farm rural employment may exceed the income generation from the increased agricultural productivity [6, 7].

Figure 4: Direct Causal Chain from Increased Farm Productivity to Reduced Hunger and Spillover Effects Causing Non-Farm Rural Employment and Poverty Reduction



Source: Oehmke, 2010.

2.0 Methodology

The primary outcome of interest is progress towards the Millennium Development Goal target of cutting poverty in ½ by 2015. To this end the primary outcome measure is the poverty rate, and the analysis focuses on quantifying reductions is household poverty attributable to the USAID-sponsored interventions. Poverty is measured by the MDG poverty line of $1.25/person/day. The interventions may generate additional benefits, such as increasing resilience among households barely above the poverty line, among others. Because of the focus on MDG targets, the analysis neglects these additional benefits.

An intermediate outcome is increased income. Along the causal pathway from agricultural intervention to poverty reduction, increased income is an essential milestone. For example, increasing the median income of the poor—even if they remain poor—makes it more likely that continued income growth will lead to sustainable decreases in poverty. Consequently this document presents analyses of both income changes and poverty reduction.

The general method used was a quasi-experimental approach using a differences-in-difference calculation of effects and impacts attributable to the USAID/Kenya-supported interventions. In this approach the changes over time in an indicator are calculated for a treatment group(s) and for a control group(s), and the change in the treatment group net of the change in the control group is attributed to the intervention. This approach is applied to household income and to poverty rates. By accounting for changes in income and poverty rates over time in the control group we can effectively net out the effects of other (non-treatment) effects on the treatment group, such as changes in rainfall, civil disturbances, and other factors.

USAID/Kenya commissioned Egerton University's Tegemeo Institute of Agricultural Policy and Development to design and conduct longitudinal household surveys explicitly for the quantification and impact assessment for USAID/Kenya sponsored agricultural development programs. A selection of 'treatment' villages in which USAID/Kenya-supported programs were operating was purposively selected to represent the areas in which the USAID/Kenya programs operated. A set of nearby, comparison villages, in which neither USAID/Kenya nor other donors

operated programs, but which was otherwise similar to the treatment villages, was selected to represent the control group. Some differences in poverty rates appear in these groups in 2004, perhaps because some interventions were underway by the time the 2004 data were collected. Within each village, a random sample of 8 households was surveyed. Those households who directly participated in USAID/Kenya sponsored programs are classified as 'treatment' households. These household are expected to earn higher incomes as a result of increased on-farm productivity, as described above in the first causal pathway. In the treatment villages, some of these households were not direct participants in the USAID/Kenya programs; for the purposes of the current analysis these households are classified as 'indirect' households. These households may benefit from learning by observing as treatment households adopt new farming techniques, they may benefit indirectly from better access to markets as supply chains improve to handle the increased production from the direct treatment households, and they may benefit from increased rural employment opportunities as direct treatment households spend their increased income on locally produced goods and services. Indirect households are expected to generate increased incomes through increased non-farm rural employment and business opportunities, as described above in the second causal pathway. Households residing in a village containing no households that were participants in the USAID/Kenya programs are the 'control' households. These households are not expected to generate any income increases that are attributable to the USAID/Kenya sponsored programs. However, there may be other factors influencing incomes in these villages. Because control villages are chosen to represent characteristics very similar to those of nearby treatment villages, these other factors are expected to affect both treatment and control villages in the same way. Therefore by subtracting the change in incomes in control villages from those of the treatment villages, the difference-in-difference approach effectively nets out the impacts of these other factors in the measurement of USAID program impacts in treatment villages.

In 2004, a sample of n=900 households was surveyed, representing direct and indirect treatment and control households for the KDDP, KDHP and KMDP programs. Between 2004 and 2006 USAID/Kenya added a fisheries activity to their portfolio as part of the Kenya Business Development Services program; this program is not analyzed in the current document. In 2006 a sample of n=945 households was surveyed representing the dairy, horticultural, maize and

fishing programs. 215 of these households were new households added to model the effects of the fisheries program. This leaves a sample of n=730 households representing the KDDP, KDHP and KMDP programs. In 2008 Tegemeo Institute was able to re-interview n=616 households from the original sample. This represented a subsample of the 2006 sample with similar statistical properties. The n=616 subsample was based on Tegemeo's statistical analysis of the 2006 sample, showing that at the village level the selected subsample and the full sample showed no statistical significant difference in mean household income The resulting sample has three years of data for n=482 households

The analysis tracked income and poverty indicators for three farm household groups (HHGs): those participating in USAID programs ("direct treatment group"); those not directly participating in USAID programs but residing in villages where USAID programs were operating ("indirect treatment group") and those households residing in villages where no USAID programs were operating ("control group"). The delineation of direct and indirect treatment groups is an innovative and singular feature of this paper, and has implications for spillover of agricultural technology and for increased income from both on-farm and non-farm rural employment.

Each household was asked about earnings from various income sources, including crop farming, livestock farming (including sales of both animal and animal products), fishing, remittances, wages and salaries, business income and other income. Gross household income was the sum of earnings from all sources for all members of the household. Respondents were asked about expenses associated with each of these income streams. Expenses included items such as seed cost, land preparation, hired labor, and fertilizer for crop farming; animal purchases, feed, and veterinary and health services for livestock farming; etc. Net household is quantified as the gross earnings less the expenses. Note that household land and labor are not costed as expenses. Thus net household income represents returns to smallholder land, labor and management, which is consistent with the literature on farm income.

A preliminary data quality assessment for the Tegemeo survey was carried out in August, 2009 at the Nairobi offices of the Tegemeo Institute. This assessment verified the questionnaire and reviewed the sampling and data storage procedures. Due to time and budget constraints the

assessment did not conduct field visits to inspect target sites or to spot check on data collected, nor was any statistical analysis of data reliability and validity performed.

In this paper, we use household incomes and poverty rates to assess impacts of specific USAID/Kenya programs. Poverty rates are calculated based on the $1.25/person/day criterion which is then translated into a poverty line. This poverty line is $1.25/person/day times the average household size in 2004 times 365/days per year times the market exchange rate on September 15, 2004. The result is a figure of 241,457Kenya shillings (Ksh). In 2004 a household is considered to be poor if its net household income is below the poverty line. For 2006 and 2008 updated poverty lines are calculated by updating the market exchange rates. Household size is not updated. In Kenya, households with growing incomes tend to expand as they take in and care for extended family members with less income. In the sample, average treatment group household size increased by nearly 3 people between 2004 and 2008. Thus increases in household size may mask reductions in headcount poverty. Consequently household size is held constant for this exercise. The poverty rate is then calculated as the number of poor households in the treatment/control group subsample divided by the total number of households in the subsample.

Poverty rates are also quantified by gender of the head of the household. Households with a change in the gender of the head (e.g. due to death or remarriage) are excluded from the sample (n=470),

Cost-effectiveness analysis is applied to the KDDP. A cost-effectiveness ratio is calculated by dividing the program cost by the number of households helped to climb out of poverty. This cost-effectiveness ratio is essentially the price tag for helping a household to climb out of poverty by providing that household with KDDP services.

The numerator of the cost-effectiveness ratio is taken be the budget costs of the program, $10.2 million. The denominator is calculated to be the number of households either directly or indirectly helped to climb out of poverty, based on poverty rates calculated from the survey data. Note that this number is a net figure, that is, it is the number of households climbing out of

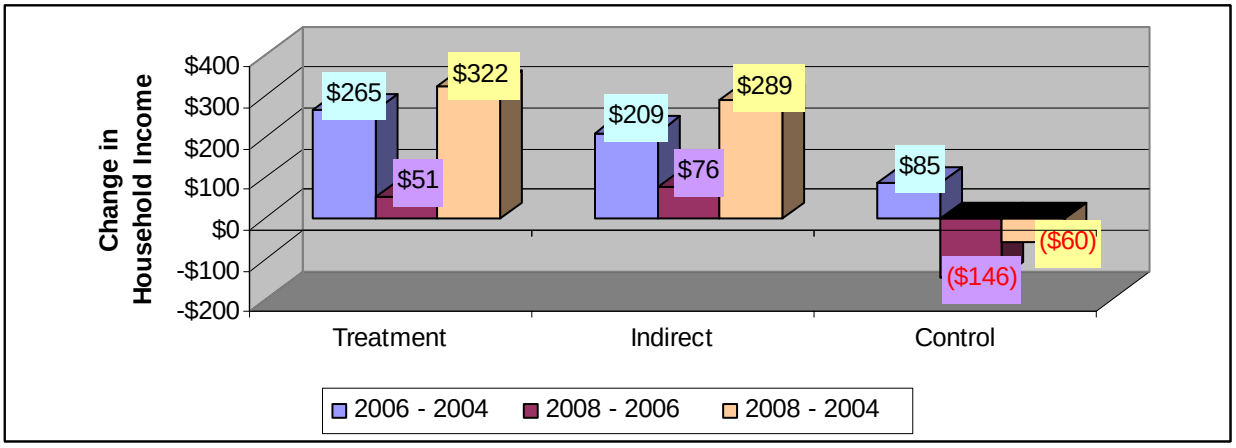
poverty net of those who may have fallen back into poverty, and net of the number who would have climbed out even in the absence of the USAID/Kenya-sponsored intervention.

3.0 Results

3.1 Impacts on Household Income

In the direct treatment group (n=286), mean net household income rose by $265 from 2004 to 2006 and $51 from 2006 to 2008, for a total increase of $322 (2008 dollars) over the 2004 to 2008 time period (Figure 5; original income differences are in Ksh converted to USD at the end-period exchange rate, so USD figures do not sum due to exchange rate fluctuations). In the indirect treatment group (n=92), mean net household income rose $209 from 2004 to 2006 and $76 from 2006 to 2008, for a total increase of $289 (2008 dollars) from 2004 to 2008. The control group (n=104) realized a mean net household income increase of $85 from 2004 to 2006 and a decrease of $146 from 2006 to 2008, for a net decrease of $60 (2008 dollars) over the period 2004 to 2008.

Figure 5: Changes in Mean Net Household Income by Treatment/Indirect/Control Group, 2004 to 2008



Source: Authors' calculations from Tegemeo data.

The changes in income attributable to the USAID/Kenya-supported intervention are the differences between the mean net income changes for the treatment and indirect groups and the change in net income for the control group. These changes are $322-(-$60) = $382 for the treatment group and $289-(-$60) = $349 for the indirect group.

3.2 Impacts on Poverty Reduction

The direct treatment group has a lower poverty rate in 2004 (61.9%) than does the indirect treatment group (74.2%) or the control group (77.6%) (Figure 1). Between 2004 and 2006 the poverty rate in the direct treatment group falls by 1.1 percentage points, 3.4% in the indirect treatment group, and 1.0% in the control group. Between 2006 and 2008 the poverty rates in the two treatment groups fall further (4.5 points in the direct group and 7.2 points in the indirect group); the poverty rate in the control group climbs (0.3 points).

The poverty reduction in the treatment groups, net of the poverty change in the control group, is attributed to the USAID/Kenya program. The poverty change in the control group from 2004 to 2008 is a reduction of 0.7%. This serves as a measure of the counterfactual situation: what would have happened if the USAID/Kenya interventions had not been in place? Between 2004 and 2008, the direct treatment group realized a net poverty reduction of 5.6-0.7=4.9 percentage points. The indirect treatment group realized a net poverty reduction of 10.6-0.7=9.9 percentage points. These 4.9 and 9.9 point reductions are attributed to the USAID/Kenya programs. Although the larger poverty reduction found in the treatment indirect group is consistent with the literature, further analysis is needed to verify the specific causal pathways that lead to this result.

Changes in poverty rates are broken down into changes across household groups (direct treatment, indirect treatment, and control) within a year (for 2004 and 2008), and changes within a household group across time (2004 v 2008). The comparisons of poverty rates are shown in Table 1. Statistical significance of the difference in poverty rates in each comparison pair is accepted/rejected at the 5% significance level (p statistics are shown).

Figure 6: Poverty Rates in Treatment and Control Groups, 2004, 2006 and 2008

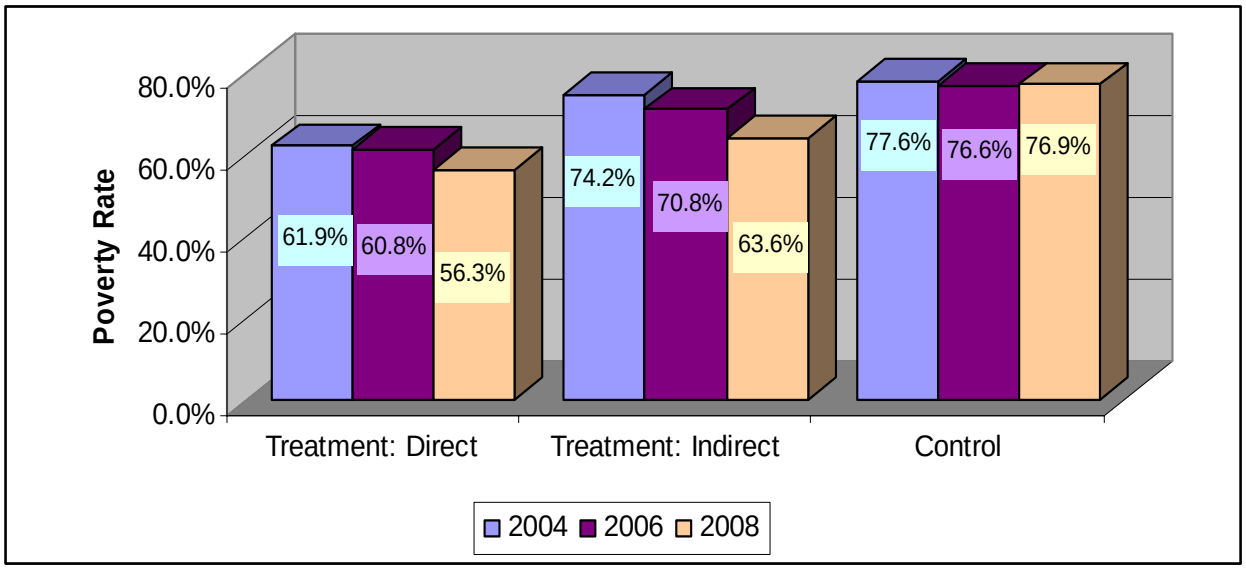


Table 1: Bivariate Comparisons of Poverty Rates across Household Groups and Years

	Comparisons Across Groups Within a Single Year		
2004			
Comparison Groups	Direct v. Indirect	Direct v. Control	Indirect v. Control
Poverty Rates	61.9% v. 74.2%	61.9% v. 77.6%	74.2% v. 77.6%
Statistical Test	χ^2=4.479 p=0.034	χ^2=8.553 p=0.003	χ^2=0.310 p=0.577
Sample Sizes	n=286 & n=89	n=286 & n=107	n=89 & n=107
2008			
Comparison Groups	Direct v. Indirect	Direct v. Control	Indirect v. Control
Poverty Rates	56.3% v. 63.6%	56.3% v. 76.8%	63.6% v. 76.8%
Statistical Test	χ^2=1.490 p=0.222	χ^2=14.053 p<0.001	χ^2= 4.106 p=0.043
Sample Sizes	n=286 & n=88	n=286 & n=108	n=88 & n=108

	Comparisons Across Years Within a Single Group			
Household group	**Comparison Years**	**Poverty Rates**	**Statistical Test**	**Sample Sizes**
Direct	2004 v. 2008	61.9% v. 56.3%	χ^2=1.850, p=0.174	n=286 & n=286
Indirect	2004 v. 2008	74.2% v. 63.6%	χ^2=2.287, p=0.130	n=107 & n=108
Control	2004 v. 2008	77.6% v. 79.8%	χ^2=0.016, p=0.900	n=89 & n=88

Source: Authors' calculations from Tegemeo/USAID dataset

In 2004 the direct treatment group has a poverty rate of 61.9%, which is statistically significantly different from the indirect treatment group poverty rate of 74.2% (p=0.034) and the control group poverty rate of 77.6% (p=0.003). The indirect treatment and control group poverty rates are not statistically significantly different (p=0.577). This suggests that 2004 may not be a true baseline in the sense that programs started in 2003 already affected the poverty rate in the treatment group by 2004, and/or that there are systemic differences in the households enrolled in the different groups. It is the authors' opinion that the latter case is more likely, since a) the decline in the poverty rate between 2004 and 2008 is not statistically significant (as will be shown momentarily), seemingly making it less likely that a change from the start of the program to 2004 would be statistically significant; and b) programs explicitly attempted to work in areas most amenable to poverty reduction, which may have influenced the selection of treatment villages (as say compared to control villages) and households within the village.

In 2008 the direct treatment group has a poverty rate of 56.3%, which is not statistically significantly different from the indirect treatment group poverty rate of 63.6% (p=0.222). The direct treatment group poverty rate is statistically significantly different from the control group poverty rate of 76.8% (p<0.001). The indirect treatment group poverty rate is statistically significantly different from the control group poverty rate (p=0.043). This suggests that something significant has happened to the indirect treatment group between 2004 and 2008, moving from a poverty status statistically similar to the control group to a poverty status statistically similar to the direct treatment group.

An additional three comparisons analyze changes in the poverty rate within each household group between 2004 and 2008. The direct treatment group poverty rate in 2004, 61.9% is not statistically significantly different from the direct treatment group poverty rate of 56.3% in 2008 (p=0.174). The indirect treatment group poverty rate of 74.2% in 2004 is not statistically significantly different from the indirect treatment group poverty rate of 63.6% in 2008 (p=0.130). The control group poverty rate of 77.6% in 2004 is not statistically significantly different from the control group poverty rate of 79.8% in 2008. The lack of statistical significance in the direct and indirect treatment poverty rates over time is unexpected, given the economically important reductions in measured poverty in these two groups, 5.6% and 10.6%, respectively. This is

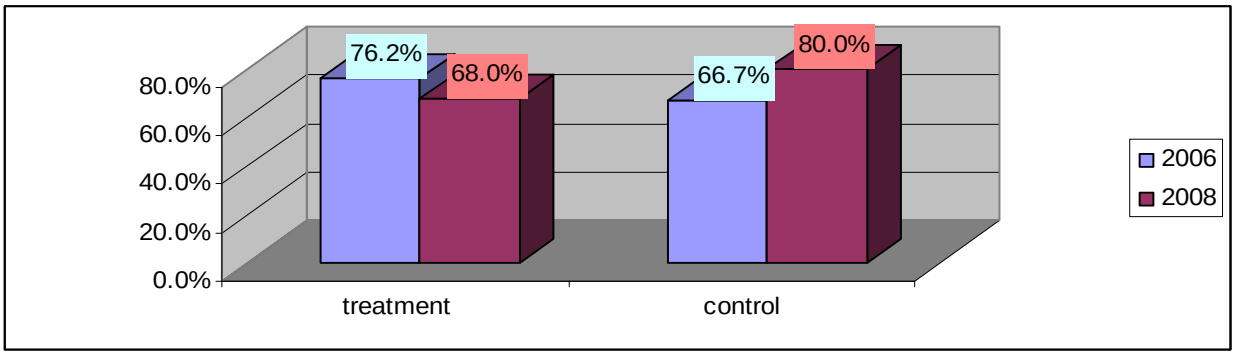
particularly the case for the indirect treatment group, which had a poverty rate similar to the control group in 2004 but more like the direct treatment group rate in 2008 (above).

The differences between the direct treatment and other groups in 2004, and the inconsistent results about the change in the poverty status of the indirect treatment group between 2004 and 2008, suggest that there are multivariate and/or omitted variable effects occurring.

3.3 Gender and Poverty

Poverty rates were calculated for households with female heads in 2006 and 2008. In 2006 the poverty rate among female-headed households in the combined treatment group (including direct and indirect treatment groups) was 76.2%, compared to 68.0% for the control group. In 2008 the poverty rate for the treatment groups had fallen 8.2 percentage points to 68.0%. The poverty rate in the control group rose by 12.3 percentage points to 80.0%. The difference between the two percentage point changes, -8.2-12.3=20.5 is the percentage point reduction in the poverty rate among female-headed households in the sample attributable to the USAID/Kenya-sponsored interventions. This reduction in poverty among female-headed households attributable to the USAID/Kenya-sponsored programs is noticeably better than the reduction in poverty among the entire sample. However, the size of the sub-sample is small (n=21 in the treatment groups and n=26 in the control group) and consequently further analysis is needed to confirm this result.

Figure 7: Poverty rates among female-headed households, 2006 and 2008, by treatment (direct and indirect) and control group; n=47.



Source: authors' calculations from USAID/Tegemeo data

3.4 KDDP: Cost-Effectiveness of Poverty Reduction

Preliminary analysis of the Tegemeo data set indicated that the dairy breeding program had the largest impact on household incomes. The cost-effectiveness of this program is quantified as the cost per household helped to climb out of poverty. The numerator of this ratio is quantified as the total expenditure on the KDDP. Total funding for KDDP is used because it is difficult to ascertain actual expenditures because expenditure data disaggregated by sub-program are not available. This creates some upward bias in the numerator. However, the dairy breeding is likely less effective without improved fodder, husbandry, marketing etc. Consequently it is anticipated that the upward bias in the numerator is minimal.

The denominator of the cost-effectiveness ratio is the number of households climbing out of poverty, attributable to the KDDP. The number of households participating in the dairy program is assumed to be 91,549, which is the actual number of households who received improved genetic material from the KDDP as reported by KDDP. This number likely underestimates the total number of households directly benefitting from KDDP activities, as others gained from training, being a member of a newly organized farmers' group, or other KDDP activities. However, it is difficult to quantify what or even if these intangibles contribute to productivity, or if any training participants were there for social reasons or incentives rather than the actual dairy knowledge. Consequently the 91,549 households receiving tangible benefits in the form of improved bovine genetics (Figure 8) is used as the number of participants in the KDDP activities, recognizing that this may be a conservative estimate.

The number of households helped out of poverty directly through improved diary farming is calculated to be the reduction in poverty rate in the direct treatment population (4.9 points) times the number of participating households, 91,549. The aggregate reduction in the poverty rate is used because sub-sample sizes become very small when disaggregating by program and household groups This results in an estimated 4,496 households who have climbed out of poverty as a direct result of KDDP. To estimate the number of households who are indirect beneficiaries, the ratio of direct to indirect household numbers is calculated for the KDDP subsample of the Tegemeo dataset. This ratio is 44%. In other words, about 2/3 of the farmers in the target villages participate in the KDDP activity(ies); the remaining households are

potential indirect beneficiaries. Based on the 91,549 direct beneficiaries, this calculation results in a potential 40,241 indirect beneficiaries. The reduction in the poverty rate among the indirect treatment population is 9.9 percentage points, or 3,984 households. The total number of households helped to climb out of poverty is thus 8,470.

Figure 8. Improved Bovine Genetics

Three calves resulting from artificial insemination and improved semen at Mr. Sambu's farm in Eldoret. Improved genetics and feeding can increase milk yield from 5kg/day to 31kg/day per cow.
Source: Land O'Lakes

The KDDP operated at a cost of $10.2 million over the period 2002-2008. Thus the cost effectiveness ratio is $172/HH/year. In other words, it cost the KDDP $172/year for six years, for each household helped to climb out of poverty. Intuitively this seems to be a very reasonable cost-effectiveness ratio, although the literature has not yet built up a selection of cost-effectiveness ratios for comparison.

Because of the greater complexity of ascertaining the degree of intervention (e.g. horticulture works with over a dozen crops) and number of potential beneficiary households for KHDP and KMDP, cost-effectiveness ratios for these programs require analysis beyond the scope of this paper.

4.0 Conclusions

This paper has examined the impacts of three USAID-supported agricultural and agribusiness productivity programs on smallholder income and poverty. A longitudinal dataset specifically designed to assess impact was analyzed using a DiD approach. Key findings are that between 2004 and 2008, net poverty in the direct treatment group decreased by 4.9 percentage points, a decline attributable to the USAID programs. Among indirect beneficiaries of the programs, a net poverty rate reduction of 9.9 points is attributable to the USAID/Kenya supported interventions. Between 2006 and 2008 poverty among female-headed households potentially benefitting from the USAID programs declined from 76% to 67%.

Limitations of the study include the omission of other variables that may be related to poverty reduction, such as household assets or local rainfall patterns in the sample years; and the lack of disaggregation of participants by intervention (except for dairy).

In addition to addressing the two limitations of the current study, future analysis of USAID/Kenya interventions and their impacts on poverty will focus on i) more detailed econometric analysis of the data to ascertain and validate more detailed causal pathways from intervention to poverty reduction, including use of asset, rainfall and other condition variables; ii) corroboration and validation of current causal pathway results in a more general development context using an available national level rural data set collected by Tegemeo for this purpose; and iii) continued updating of the data set to quantify continued and sustainable impacts on poverty reduction, starting with the data collected in 2010 (not yet available).

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