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POLICY BRIEF

AGRICULTURAL PRODUCTIVITY IMPACTS IN KENYA

A SYNTHESIS OF FINDINGS

Based on studies written by Melinda Smale, Mary Mathenge, Thomas S. Jayne, Eduardo Magalhaes, John Olwande, Lilian Kirimi, Mercy Kamau, James Githuku, James F. Oehmke, and Sarma B. Aralas

This brief summarizes the impact assessments of the USAID/Kenya–supported agricultural productivity programs—specifically, the Kenya Dairy Development Program (KDDP, 2002–08), Kenya Dairy Sector Competitiveness Program (KDSCP, 2009–14), Kenya Horticulture Development Program (KHDP 2003–10), and Kenya Maize Development Program (KMDP, 2002–10+). The brief covers the studies by Oehmke et al. (2010) and Smale et al. (2011). These studies were led by the Tegemeo Institute of Agricultural Policy and Development at Egerton University in Nairobi, Kenya.

The objectives of the studies were to (1) quantify the impact of the programs on household income and smallholder poverty reduction, (2) determine the programs' cost-effectiveness in reducing poverty, and (3) illuminate the causal pathways from project activity to poverty reduction.

AGRICULTURAL PROGRAMS IN KENYA

Land O'Lakes operated the KDDP in Kenya from September 2002 through April 2008 with expenditures of $10.2 million. KDDP interventions were grouped into four strategic areas: (1) activities for enhancing dairy productivity, (2) policy advocacy activities, (3) dairy product quality and affordability activities, and (4) building capacity in the dairy industry. Activities to increase productivity included the distribution of genetically improved crop seeds, animal husbandry training, farmer use of software to manage feed rations, improved forage production technologies, innovations in milk preservation (cold chain), the training and certification of milk traders, the development of private-sector artificial insemination services, and the development of dairy cooperatives. Productivity rose from 8.6 to 10.25 liters per cow per day, and unit costs were reduced by 16 percent.

In 2008 USAID/Kenya invested in the KDSCP, also operated by Land O'Lakes, as a five-year follow-up to the KDDP, funded at $9 million. KDSCP (1) develops quality standards for dairy products

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and supports policy reform initiatives, (2) promotes the market expansion of milk and other dairy products, (3) helps to forge business-to-business linkages between small businesses and processors, (4) grants funds to stimulate industry innovation, (5) creates a directory of service providers for the dairy industry, (6) improves industry policies and acts to enhance competitiveness, and (7) builds capacity of various players in the dairy value chain.

Fintrac operated the KHDP since its establishment in 2003, initially as a four-year program but with extensions through March 2010. The program operates in the traditional horticultural production areas but targets smallholders on marginal lands who haven't previously received assistance. The programs' Kiswahili slogan translates as "increased incomes through better farming." Key strategic areas of intervention include (1) sanitary and phytosanitary standards compliance, (2) domestic market growth, (3) product development, (4) development of Kenya–United States trade in horticultural products, and (5) intensification of tree crop production, particularly in Coast Province. KHDP's focus crops include passion fruit, chilies, vanilla, smallholder flowers, cashew, mango, and local market vegetables such as onions, carrots, cabbage, tomatoes, and indigenous vegetables. Production of cabbage and tomatoes doubled and onion production nearly doubled from 2002 to 2007. Fintrac reports that as a result of the program, 58,000 individuals increased their incomes by an average of $340 per year through 2009. In 2010 USAID/Kenya launched the Kenya Horticulture Competitiveness Project as a five-year follow-on funded under the Feed the Future Initiative.

KMDP originally operated as a four-year program by ACDI/VOCA and was extended through 2010 with a total budget of $11.2 million. The program's goals included increasing productivity, improving the effectiveness of smallholder organizations, and linking smallholders to markets. Specific activities included training on the use of improved seed varieties, fertilizer, and conservation; training on marketing, including warehousing; and working with input distributors to meet smallholder needs. ACDI/VOCA reported three- and four-fold increases in yields, from a baseline of 720 kilograms per acre to 2,880 kilograms per acre in 2007 before dropping to 2,350 kilograms per acre in 2008, due in part to low rainfall and high fertilizer prices. KMDP reported that its interventions have helped smallholders raise gross earnings by $637 per household from 2004 to 2009.

METHODS

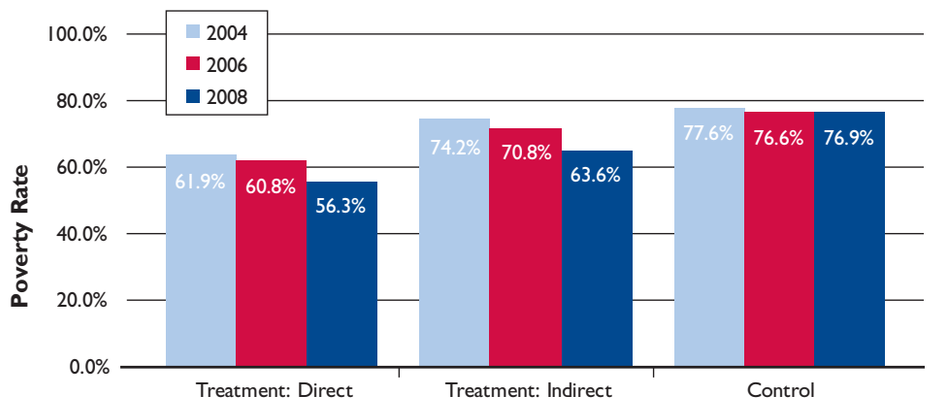
The primary dataset comprises longitudinal rural household survey data from 2004, 2006, 2008, and 2010. These data were specifically designed for quasi-experimental analysis of the effects of USAID/Kenya–supported programs on household income and poverty reduction. USAID/Kenya supported primary data collection of a USAID Indicator dataset by the Tegemeo Institute of Agricultural Policy and Development at Egerton University, which maintains and analyzes the data with technical support from Michigan State University. The 2004 data were used as baseline data. The second study supplemented these data with data from a Tegemeo Institute representative rural household survey collected under the Tegemeo Agricultural Policy Research and Analysis (TAPRA) project, also supported by USAID/Kenya.

The basic method was quasi-experimental modeling with a difference-in-differences approach. The initial impact study applied a basic case-comparison approach to household income and poverty status among three groups: (1) a direct treatment group, defined as smallholders directly participating in a USAID-supported project; (2) an indirect treatment group, or smallholders living in a village where a USAID-supported project was active but who were not directly participating in the project; and (3) a comparison group, or smallholders living in a village where no projects were active (Oehmke et al. 2010). This study covered the period 2004 to 2008 and relied exclusively on the USAID Indicator dataset.

The second study (1) extended the dataset to include the 2010 survey data, (2) applied econometric methods to control for external influences on smallholder income, (3) used a single treatment group (combining direct and indirect treatment subgroups), and (4) used as comparison groups both the specified comparison households from the USAID Indicator dataset and all TAPRA households in the same rainfall zone as the treatment group (Smale et al. 2011). The latter serves as a proxy for the nationally representative smallholder within the rainfall zone.

The cost-effectiveness of USAID agricultural programs for poverty reduction was quantified by the cost per individual emerging from poverty. A cost-effectiveness ratio was calculated for KDDP activities from 2004 to 2008 (Oehmke et al. 2010). Costs were measured as dollar costs of the USAID project, including overhead and administrative costs. The number of individuals emerging from poverty was estimated as the number of individuals adopting improved bovine genetics multiplied by

FIGURE 1—POVERTY RATES IN TREATMENT AND CONTROL GROUPS, 2004, 2006, AND 2008.



Source: Author's calculations from USAID/Tegemeo data.

TABLE 1—ESTIMATES OF PROGRAM INCOME EFFECTS, 2004–10

Comparison subgroups	Impact indicator	
	Household income, Kenyan shillings (KES)	Net off-farm income, Kenyan shillings, (KES)
USAID indicator sample		
Direct beneficiary v. comparison	124,071 (P=.02)	77,207 (P=.07)
Indirect beneficiary v. comparison	162,707 (P=.08)	142,297 (P=.13)
	n=1754	n=1754
Combined USAID indicator & TAPRA sample		
Direct beneficiary v. representative smallholder	75,650 KES (P=.07)	64,870 (P=.05)
Indirect beneficiary v. representative smallholder	166,500 KES (P=.08)	154,700 (P=.06)
	n=2458	n=2479

Source: Smale et al. 2011.

Note: Table values are econometrically estimated using a difference-in-differences approach. n=number of observations, where an observation comprises a household observed in a particular year; TAPRA = Tegemeo Agricultural Policy Reseach and Analysis

the proportionate reduction in treatment-group poverty attributable to KDDP.

RESULTS

Analysis of impacts from 2004 to 2008. Between 2004 and 2008, a poverty reduction of 4.9 percent among participating households was attributed to the USAID programs. The analysis tracked poverty indicators for the three groups defined above: direct treatment group, indirect treatment group, and control group. The differences over time in the poverty rates in these three groups are shown in Figure 1.

Among households that were expected to be indirect beneficiaries of the programs, a poverty rate reduction of 9.9 points was attributed to interventions supported by USAID/Kenya. Between 2006 and 2008, poverty among female-headed households potentially benefitting from the USAID programs declined from 76 percent to 67 percent.

The cost-effectiveness of the KDDP program in reducing poverty was estimated to be $34 per year per person emerging from poverty.

Analysis of impacts from 2004 to 2010. Based on the USAID Indicator dataset, the estimated impact of all programs combined was an increase in smallholder incomes by 124,071 Kenyan shillings (KES) for direct beneficiaries and by KES 162,707 for indirect beneficiaries, relative to the income increases that occurred in the comparison group (Table 1). These changes comprised KES 46,864 in net farm income and KES 77,207 in net off-farm income for direct beneficiaries, and KES 20,410 in net farm income and KES 142,297 in net off-farm income for indirect beneficiaries. The increase in direct beneficiary income was statistically significant at the 5 percent level.

Based on the combined USAID Indicator and TAPRA samples, and using the USAID Indicator comparison households plus the TAPRA households as a comparison group comprising nationally representative smallholders, the USAID agricultural projects increased direct beneficiary income by KES 75,650. Indirect beneficiaries realized an income rise of KES 166,500 attributable to the programs. The direct and indirect beneficiary increases were KES 10,780 and KES 11,800, respectively, in net farm income and KES 64,879 and KES 154,700, respectively, in net off-farm income. The increase in direct beneficiary off-farm income was statistically significant at the 5 percent level.

A decomposition of income increases by the program was limited somewhat by the sample size. For dairy programs, decomposition by beneficiary subgroups revealed increases in direct beneficiary income of KES 164,744 and indirect beneficiary income of KES 164,527 (Table 2). The increases for direct beneficiaries comprised KES 41,024 in the value of milk sold and KES 123,720 in other income. Indirect beneficiaries saw increases of KES 50,060 in milk sales and KES 114,467 in other income. The changes in direct beneficiary income and sales and indirect beneficiary sales were statistically significant at the 5 percent level.

For KHDP, income for direct and indirect treatment groups increased relative to the comparison group by KES 104,571, of which KES 15,838 was due to horticultural sales. Relative to the representative smallholder, treatment group income increased by KES 107,911, and KES 33,519 of this is due to horticultural sales. Each figure is statistically significant.

A comparison of the direct and indirect maize treatment groups and comparison groups from the USAID Indicator dataset revealed an income decrease of KES 14,682 that was not statistically significant, and a positive but not statistically significant increase in the value of maize sold (Table 2). For all treatment group smallholders, nonfarm income gains constituted 60 to 90 percent of household income gains. This indicates a vibrant development dynamic in which agricultural productivity gains are leveraged into nonagricultural economic opportunities. The details of this dynamic warrant a thorough investigation.

CONCLUSIONS AND LESSONS LEARNED

As a group, the agricultural programs supported by USAID/Kenya had economically and statistically significant impacts on smallholder income; the dairy and horticultural programs each had economically and statistically significant impacts. Analysis of the dairy program showed a

cost-effective poverty-reducing impact. Given that the smallholder income change associated with the horticulture program was about two-thirds the size of the dairy program's impact, it is concluded that the horticultural beneficiary may also realize further significant poverty reduction.

The decomposition of household income increases provides crucial empirical evidence into smallholder income growth. Although changes in sales of milk and horticultural products increased, the bulk of the income growth comes from other sources, including nonfarm income growth.

REFERENCES

Oehmke, J., T. S. Jayne, S. B. Aralas, and M. K. Mathenge. 2010. *Impacts of USAID/Kenya-Supported Agricultural Productivity Interventions on Household Income and Poverty Reduction.* Tegemeo Institute Working Paper WPS 38. Nairobi, Kenya: USAID.

Smale, M., M. Mathenge, T. S. Jayne, E. Magalhaes, J. Olwande, L. Kirimi, M. Kamau, and J. Githuku. 2011. *Income and Poverty Impacts of USAID-Funded Programs to Promote Maize, Horticulture, and Dairy Enterprises in Kenya, 2004–2010*. Tegemeo Institute Working Paper. Nairobi, Kenya: USAID.

TABLE 2—ESTIMATES OF INDIVIDUAL PROGRAM INCOME EFFECTS, 2004–10

	Household income, Kenyan shillings (KES)	Value of target commodity sold, Kenyan shillings (KES)
Kenya Dairy Development Program/ Kenya Dairy Sector Competitiveness Program		
Direct beneficiary v. representative smallholder	164,744 (P=.03)	41,024 (P=.04)
Indirect beneficiary v. representative smallholder	164,527 (P=.12)	50,060 (P=.02)
Kenya Horticulture Development Program		
All beneficiary v. comparison	104,571 (P=.03) (n=353)	15,838 (P=.00) (n=353)
All beneficiary v. representative smallholder	107,911 (P=.01) n=1598	33,519 (P=.00) n=1581
Kenya Maize Development Program		
All beneficiary v. comparison	-14,682 (P=.83) (n=372)	1,042 (P=.95) (n=246, includes only maize sellers)

Source: Smale et al. 2011.

Note: Table values are econometrically estimated using difference-in-differences approach. n=number of observations, where an observation comprises a household observed in a particular year.

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U.S. Agency for International Development
1300 Pennsylvania Avenue, NW
Washington, DC 20523
Tel: (202) 712-0000
Fax: (202) 216-3524
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