Overview

Common wisdom: Access to formal credit is limited; farm inputs are financed largely through informal credit.

Findings:

- The use of credit (formal, informal, tied, and untied) for financing modern inputs is extremely low.
- Low use of credit applies in all countries and for all crops and farm sizes. The use of credit for financing inputs is similar for food crops and cash crops.
- Farmers primarily finance modern input purchases with cash from nonfarm activities and crop sales.
- Tied output-factor market arrangements with input traders and output traders play a minor role in financing external inputs, but appear to be relatively widely used for labor credit.
- “Traditional cash crop” farmers selling to processors rarely receive credit from processors, except in a few enclaves, such as larger tobacco farmers in Tanzania.
- Access to loans (mostly informal) has a favorable effect on fertilizer use.
- Nonfarm self-employment is associated with greater use of fertilizers.

Policy message: Rural development policies and programs that spur broad development of the rural nonfarm sector would benefit farm input purchases and thus productivity and food security. These policies and programs would be important complements to credit policies and programs.
The Issue: How Are Farmers in Africa Financing Modern Input Use?

Recent evidence indicates that many farmers in Sub-Saharan Africa purchase external inputs such as fertilizer, seeds, and pesticides and herbicides (see chapter 10, and Sheahan and Barrett 2014). However, there is limited information on how the increasing use of modern inputs is being financed. This study therefore investigates empirically how African smallholders finance the purchase of modern external inputs.

The study derives testable hypotheses from the literature, which, over the years, has fed conventional wisdom about how African farmers finance agricultural activities. Points of conventional wisdom include the following:

- Farmers use little to no formal bank credit to finance input purchases.
- Farmers rely heavily on informal credit from two sources. The first is input and output traders, who give farmers advances and, in the case of output traders, “tie” their output sale to the provision of credit at the start of the season. Second, farmers are believed to obtain credit from friends, family, and village moneylenders to finance input purchases.
- Farmers in cash crop contract farming schemes obtain input credit from processors.

The Analysis: Combining Description with Multivariate Analysis

The study tests these three sets of common wisdom. The analysis fills a gap in the literature, because there is no current and systematic inventory of how farmers pay for inputs. To fill this gap, the study undertakes a cross-country empirical examination of input finance among smallholders, using recently available, nationally representative Living Standards Measurement Study farm household survey data sets. These data comprise more than 10,000 households in four countries: Malawi, Nigeria, Tanzania, and Uganda. The study focuses on purchases of “external inputs,” that is, nonlabor variable inputs (fertilizer, pesticides, and seeds) and of labor. Relying mostly on descriptive statistics on formal and informal tied and untied credit sources, the study explores the influence of crop types (cash crops versus food crops) and farm size. It also uses econometric regression methods to examine the correlates of input purchases.

The Results: Use of Credit for Input Purchases Is Not Commonplace

There Is Much Variation across Countries in Modern External Input Purchases

The survey data show that there is a marked contrast across countries. Nigeria and Malawi have a high share of farmers (71 and 70 percent, respectively) buying external inputs such as fertilizer, improved seeds, and pesticides. In Uganda and Tanzania, the share is lower—16 and 18 percent, respectively.
The results for Malawi and Nigeria are at odds with the traditional notion that few farmers in Sub-Saharan Africa use external inputs, but are consistent with recent literature (Sheahan and Barrett 2014). The results in Malawi and Nigeria might be driven by their fertilizer subsidy programs. That is likely to be true in Malawi, where about 60 percent of households receive subsidized fertilizer (Chirwa and Dorward 2013). But the Nigeria data show that only 5 percent of households that purchase fertilizer bought it from government sources (the channel through which subsidies were delivered at the time of the survey).

**The Use of Credit for Input Purchases Is Rare**

Although there is significant variation across countries in input purchases, there are only modest differences in the use of credit for these purchases. On average, about 6 percent of households that buy these inputs use any form of credit (figure 4.1). This finding suggests that an average of 94 percent of African households use their own cash (from noncredit resources, such as cash sales of crops, and employment earnings) to buy external inputs. This finding goes against the general presumption that farmers would use informal credit (from moneylenders, friends, and family) or trader credit. The survey data reveal not just a case of limited formal credit but also a near absence of the use of any credit, formal or informal, tied with input or output traders, in kind or in cash.

**Figure 4.1 Very Few Farmers Who Buy External Inputs Use Credit**

![Bar graph showing the percentage of farmers who use credit to buy external inputs in Malawi, Nigeria, Tanzania, and Uganda](http://dx.doi.org/10.1596/978-1-4648-1134-0)

*Source:* Computations based on Living Standards Measurement Study–Integrated Surveys on Agriculture (LSMS–ISA) data.
Credit Is More Commonly Used for Fertilizers Than for Other External Inputs
Credit is most commonly used for purchases of fertilizer in Tanzania and Uganda, where about 14 percent of fertilizer purchases are financed in this way. In Malawi and Nigeria, where the majority of farmers buy external inputs, credit is not the major source of finance, even for fertilizer purchases. In sum, the importance of input credit tends to be mainly for fertilizer purchases, and not for pesticides and seeds. Two to three times more households tend to obtain some kind of credit for fertilizer purchases, compared with seeds or pesticides and herbicides.

Input Credit Is Related to Farm Size in Malawi, Tanzania, and Uganda
Most credit-based external input purchases in Malawi, Tanzania, and Uganda are concentrated in farms that are larger than one hectare (figure 4.2). Nigeria is an exception, with more of the input credit taken by the “under one hectare” group. These results do not differ much over input type.

The Use of Input Credit Is Rare, Even for Traditional Cash Crop Production
Conventional wisdom suggests that farmers growing traditional cash crops (such as cocoa, cotton, tea, and tobacco) would commonly access external inputs on credit, in particular from processors, while food crop producers would not. But the results of the study indicate that although there is a lot of variation across countries, the average share of credit-financed input purchases over all traditional cash crops is 13 percent, compared with 6 percent for food crops. The cash crop share is mostly driven by tobacco producers, who represent only about 1 percent of the total sample. These producers receive input credit for tobacco production through contract farming arrangements.

Figure 4.2 Credit-Financed Inputs Are More Common in Larger Farms

![Bar chart showing the percentage of credit-financed inputs by farm size in Malawi, Nigeria, Tanzania, and Uganda.](chart)

Source: Computations based on LSMS–ISA data.
Excluding tobacco plots puts the overall credit share of traditional cash crop producers close to that of food crop producers.

The results vary across countries. In Nigeria and Uganda, there is little difference in the use of credit between cash and food crop farmers. In Malawi and Tanzania, the difference is more striking (in the latter case because of tobacco farming).

“Tied Credit” Is Rare for External Inputs but More Common for Labor Inputs

Tied output and input credit arrangements occur when credit for inputs or cash for inputs (received at planting) is repaid at harvest time. The study finds that less than 2 percent of farmers across all countries use tied credit arrangements for external inputs. However, labor output-tying is much more common, with as many as 42 percent of the farmers in Malawi, 26 percent in Nigeria, and 68 percent in Tanzania engaged in this (see figure 4.3).

Loans Are Rarely Used for Farming

Loans (defined here as credit unconnected directly to transactions of outputs or inputs) can come from formal (banks), semiformal (microfinance), or informal (friends, relatives, cooperatives, and so forth) sources. Although data on the actual use of loans were not available for Nigeria, as much as 38 percent of the sample households took loans. In the Malawi sample, 23 percent of the households took a loan, but only 5 percent of those households did so for farming. In Tanzania, 11 percent of households took loans, of which 2 percent were for farming purposes. This is a 5-to-1 ratio of overall loans to farm-destined loans in both countries. It is quite striking that loans are predominantly used to finance nonfarm business start-up costs and consumption.

Figure 4.3 Tied Credit Is Important for External Labor but Not for Inputs

Source: Computations based on LSMS–ISA data.
Understanding Farmers’ Decisions

Regression Analysis
The study expands the descriptive analysis with a multivariate regression analysis of the fertilizer purchase decision and the intensity of purchases by Nigerian farmers. Using panel data and probit and Tobit estimation methods (box 4.1), the analysis emphasizes the role of nonfarm employment (wage and self-employment) and agricultural productivity risks (captured by rainfall variability), as well as regional differences (North versus South) in decisions on fertilizer purchases and intensity.

Box 4.1 Econometric Modeling of Input Purchases

Fertilizer demand can be expressed as a function of output and input prices, risk proxies, complementary and substitute farm capital, and relevant shifter variables, such as crop type. The study considers the decision to purchase fertilizer and then the intensity of use. In each case,

\[ Y_{it} = f(X_{it}, u_{it}) \]

where \( Y_{it} \) refers to the binary-input-use variable or the quantity of fertilizer purchased (in kilograms), \( X_{it} \) refers to a vector of controls that explain fertilizer demand, and \( u_{it} = \varepsilon_{it} + c_i \) is a composite error term comprising time-invariant unobservable heterogeneity (\( c_i \)) and time-varying unobserved characteristics (\( \varepsilon_{it} \)) of the input demand function. The study models farmers’ fertilizer purchase decisions using the standard-unobserved-effects, binary-dependent-variable model. The intensity of fertilizer use is modeled using the unobserved-effects Tobit model to account for the corner solution nature of the dependent variable. In both models, \( c_i \) represents the unobserved-effect parameter called correlated random effects (CRE):

\[
\begin{align*}
    c_i & = \psi + \overline{X_i} \xi + a_i, \\
    a_i | X_i & \sim \text{Normal}(0, \sigma_a^2)
\end{align*}
\]

where \( \overline{X_i} \) represents time averages of the explanatory variables. The CRE model is preferred over alternative methods, such as the fixed effects and random effects models, in the case of nonlinear models. However, for comparison, the study estimates the linear model with household fixed effects, given its suggested conceptual robustness over nonlinear models, such as the probit and Tobit.

Consistent with the CRE model, the determinants of the fertilizer purchase decision and level of use are estimated using pooled probit and Tobit regressions, respectively. Each regression equation includes a set of explanatory variables, as well as the time averages of these variables. A Wald test of joint significance of the time average variables is performed to test whether a traditional random effects model would be appropriate. A dummy variable for the time period is included to account for time-specific factors that affect fertilizer demand. Since it is not possible to completely rule out endogeneity...
Box 4.1 Econometric Modeling of Input Purchases (continued)

due to time-varying unobservables, the results are interpreted as correlates rather than causal effects.

The following explanatory variables were used for the use and intensity regressions:

Proxies for input finance: rural nonfarm income, crop sales, and whether a household member had previously obtained credit.

Socioeconomic variables: gender, age, and education of the household head, and the household dependency ratio to capture the household's composition and productive structure.

Household assets: size of total landholdings (in hectares) and a principal-components assets index reflecting household ownership of agricultural assets (tractors, pumps, plows, and so forth).

Environmental factors: dummies for the main zones in Nigeria (Northeast, Northwest, Southeast, Southwest, and Southcentral), reflecting infrastructural and growing conditions, and dummies for urban and rural. The regressions also controlled for the shares of grains, legumes, tubers, horticulture crops, oil crops, and so forth in total land cultivated by the household, which reflect biophysical differences.

Regression Results

The results reveal substantial differences between northern and southern Nigeria. Most relevant determinants of fertilizer purchases show higher significance in the North compared with the South. This possibly reflects that farmers in the North use more fertilizers and therefore are more responsive to various determinants than farmers in the South are. The following are the key messages emerging from this analysis:

Access to loans affects fertilizer purchase positively. The effect is significant only in the northern part of Nigeria. A closer look indicates that loans from friends and relatives (rather than loans from formal and semiformal institutions) seem to drive most of this result, illustrating that loans, especially loans from formal and semiformal institutions, are limited for agricultural investment.

Nonfarm self-employment also has a positive effect. Participation in nonfarm self-employment raises the likelihood of purchasing fertilizers by about 7 percent—an effect that is present in North and South Nigeria.

Rainfall is important. As expected, the coefficient of variation of rainfall has a strongly negative effect on fertilizer purchasing, but is significant only in the North. This result is important, as investments in modern input use, although generally profitable, are costly and can yield very low (or even negative) returns in case of negative weather shocks.

Education is important. Education of the household head has a positive and significant effect in both the North and the South.
Farm size matters in the North. The farm size effect is significant and positive only in the North; the effect is negative but not significant in the South.

The Implications

This study finds that few farmers in these African countries use any form of credit, formal or informal, to finance external input purchases. What is still significant is the link between the labor and output markets through informal arrangements. Although farmers take loans to finance the start-up of nonfarm enterprises rather than the purchase of external inputs, they use cash from these nonfarm enterprises and crop sales to purchase external inputs.

The main policy implication of the research is that retained earnings from employment income pay for almost all farm inputs in the countries studied. Subsidies are minor, and credit, informal or formal, is also minor. The earnings that pay for farm inputs come mainly from rural nonfarm employment (RNFE), some from crop sales, and a little bit from migration. Currently, RNFE is mainly from local services linked to agri-food supply chain off-farm activities, like commerce and processing and logistics. This finding suggests a virtuous circle of helping the farm and food supply chains to co-develop, to generate cash to buy inputs to ratchet up productivity via farm investments over time. Farm credit is lacking, but a current concern is that agricultural sales and RNFE are relatively concentrated among a subset of households. That concentration translates into concentration in farm investments, and hence productivity gains. All that can be done to help agricultural commercialization and RNFE development to be broad-based and inclusive is important. The results of the study point to the extreme centrality of factors to reduce entry barriers to RNFE and agricultural sales (for example, roads and other infrastructure, as well as research and training) and allow more farm zones and farmer strata to find it easier to participate.

The study indicates that further analysis of the factors that explain the limited use of noncash income sources to finance external input purchase is called for. In addition to credit availability, issues such as the associated interest rates and expected returns to investing in modern external inputs should be explored.

Additional Reading

This chapter draws on:

Other key references:
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