Rural Household Access to Assets and Agrarian Institutions: A Cross Country Comparison

Alberto Zezza[1],[§], Paul Winters[†], Benjamin Davis[§], Gero Carletto[‡], Katia Covarrubias[§], Esteban Quiñones[§], Kostas Stamoulis[§], and Stefania DiGiuseppe[§]

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[1] Corresponding Author (email: alberto.zezza@fao.org); [§] Agricultural Development Economics Division, Food and Agriculture Organization; [†] American University; [‡] World Bank.

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Abstract

Agriculture is at the core of the livelihoods of a large share of rural households throughout the developing world. Agricultural growth is a major engine for overall economic growth and possibly the single most important pathway out of poverty in the rural space. This paper characterizes household access to assets and agrarian institutions of households engaged in agricultural activities in a sample of developing countries. The evidence presented in the paper draws from 15 nationally representative household surveys from four regions of the developing world. We find that the access of rural households to a range of agricultural-specific assets (including land and livestock) and institutions is in general low, though highly heterogeneous across countries, and by categories of households within countries. A large share of rural agricultural households do not use or have access to basic productive inputs, agricultural support services or output markets, and in general it is the landless and the smallest landowners who suffer significantly more from this lack of access. We relate this to the households' ability to engage successfully in commercial farming and find consistent supporting evidence for the hypothesis that this lack of access is significantly constraining their potential to engage successfully in agriculture.

I. Introduction[2]

Assets are key determinants of household welfare. Ownership and/or access to a range of assets determines to a large extent the livelihood strategies of poor rural households and whether they manage to stay or get out of poverty. In agriculture, the combination of assets endowments and access to *agrarian institutions* is crucial in forming the incentives faced by agricultural households and their ability to respond to changes in markets and policy. This is why a sizeable share of the agricultural economics literature, particularly of that concerned with developing regions, is devoted to the study of issues such as the availability of different forms of capital, the performance of input, output, and factor markets, the delivery of agricultural support services and the generation and adoption of agricultural technology.

Although a significant amount of theoretical and empirical work focuses on the analysis of assets and agrarian institutions, we are not aware of any study that has carried out this type of analysis in a large cross section of countries using internally consistent data. The objective of this paper is to describe the asset position of rural agricultural households in a sample of developing and transitioning countries to document access to agrarian institutions and ultimately to characterize the heterogeneity of access to these assets and institutions. We then relate this to some measures of agricultural market orientation and successful engagement in agricultural production and commercialisation, to assess the extent to which constraints in access to assets and basic inputs limit households' ability to fully exploit the potential of agriculture to serve as a pathway out of poverty.

In this paper the focus is largely on agriculture-specific assets and services. This does not in any way imply that activities other than agriculture are unimportant in rural areas. To the contrary, we discuss in a companion paper (Davis et al., 2007) the importance of income diversification in rural areas and investigate its relationship with access to assets.

Furthermore, inequality in asset distribution reduces the potential for poverty reduction both directly and indirectly. Directly, as the more unequal the distribution of assets the lower the share of economic growth that will accrue to the poor. Indirectly, as an unequal distribution of assets can reduce the rate of economic growth (Birdsall and Londoño 1997). But even leaving distributional issues aside, characterising household access to key assets and services provides insights on the potential for (agriculture based) rural growth. Clearly one cannot reasonably expect agricultural growth if access to land, basic inputs, credit and technical assistance is minimal for a vast majority of the households that are engaged in farming. And given the importance of agricultural growth for poverty reduction (World Bank, 2007; Timmer, 1997; Ravallion and Datt, 1996) the implications for policymakers and donors whose stated primary goal is the eradication of poverty are clear.

While this paper takes a largely descriptive approach to the discussion of these issues, we also use a multivariate framework to investigate the correlation between access to inputs and services to market participation. Specifically, we look at the share of output sold by agricultural households and the total value of agricultural sales, which we maintain are fairly direct –if rough- measures of relative success in agriculture.

The analysis is based on the Rural Income Generating Activities (RIGA) database. The database consists of datasets from nationally representative household surveys in 15 countries,

from four geographical regions. The database was created primarily to construct comparable income aggregates for a range of developing and transition countries, but includes information on agricultural production, market participation and access to agrarian institutions and various types of assets. It also includes consumption expenditure variables that have been also constructed in a comparable manner and allows for comparisons of variables across socioeconomic status.

The paper is organised as follows. The next section briefly review some of the empirical evidence linking access to assets and agrarian institutions to outcomes of interest such as poverty, income and agricultural productivity. Section 3 describes the RIGA database used for the analysis and discusses the approach taken in using the data for the purposes of the paper. Section 4 then focuses on household ownership of three key assets: land, livestock and infrastructure. Section 5 begins the examination of agrarian institutions by analyzing the utilization of productive inputs which reflects access to and functioning of markets for such inputs. This is followed in section 6 by an examination of the participation of agricultural households in output markets. In section 7 we characterize the support provided to rural households in terms of technology delivery, extension services and credit access, all of which are areas where governments have historically provided support to agricultural households. Section 8 presents preliminary results of a multivariate analysis aiming at investigating how access to assets, inputs and agrarian institutions relate to performance on agricultural output markets. The final section presents some concluding remarks.

II. Context: Assets, institutions, agriculture and poverty reduction

The development literature illustrating how assets and institutions drive income opportunities and poverty outcomes is vast. In this section we merely review a selection of the studies that have been devoted to document these relationships between some main assets and institutions and the economic performance of agricultural households. We classify assets into the following categories: human capital (education and household labour force), natural capital (land access), physical capital (the ownership of assets such as livestock and machinery), public capital (access to public services and infrastructure such as schools, health clinics, and electricity), social capital (participation in organizations, associations and links to other individuals and households, both within and outside the community), financial capital (access to credit, insurance) and geographic capital (locational factors such as proximity to markets; Jalan and Ravallion 2002).

For agricultural households, the asset on which much of the literature is historically focussed is, of course, land[3]. Despite the obvious link between access to land and agricultural incomes, the extent to which land can be serve as an instrument for poverty reduction has been the subject of a lively recent debate. While some argue that the potential impact of redistributive land policies on income is small or negligible (Lopez and Valdes, 2000) others maintain that, particularly at the bottom end of the land distribution and in conjunction with other assets, increased access to land can have significant positive effects on income (Finan et al. 2005). Alternative mechanisms of access to land other than outright ownership have also been shown to be important, especially for the poor, throughout the developing world[4]. Particularly in the presence of credit and insurance market imperfections land rental markets, sharecropping and

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[3] As already stated, we do not deal with human capital issues in this paper. The role of education and labour endowments are covered in two companion papers (Davis et al., 2007 and Zezza et al., 2007).
[4] See Lastarria-Cornhiel and Melmed-Sanjak (1999) for a review and an extensive bibliography of studies of land tenancy in Asia, Africa and Latin America.

other tenancy arrangements (including traditional land tenure systems in Africa), perform an important function in both equalising access to land assets and improving efficiency (Skoufias, 1991; Deininger and Feder, 2001; Chimhowu and Woodhouse, 2006; Deininger 2007).

Public capital is a critical complement to human and physical household asset endowments. For example, Nargis and Hossain (2006) show that Bangladeshi households with electricity access earned from 11 to 18 percent more than those in villages without electricity. Studies on the impact of road construction and improvements link this resource to higher overall income (Ahmed and Hossain 1990), more land and livestock (Escobal and Ponce 2002), higher land values (Jacoby 2000) and greater agricultural output (Ahmend and Hossain 1990; Binswanger et al 1993). Further, Jalan and Ravallion (2002) find that road networks have positive consumption effects on rural households in China.

Government investment in basic public goods that target demand and supply of inputs such as rural infrastructure (roads and electricity), education, agricultural extension and market information systems, can also result in improved access to agricultural input markets. In particular, the growth of input supply can be mobilized if the issue of high transaction costs is addressed since these costs discourage input suppliers from reaching farmers in dispersed communities or in remote areas (Kelly et al 2003; Bingen et al 2003). This reinforces the notion of geographic capital as a factor in a household's potential to exit poverty (Jalan and Ravallion 2002; Valdés and Mistiaen 2001).

Participation in output markets, and the extent to which households market their production (measured by sales) is positively related to educational attainment, physical capital (such as livestock) and visits by extension agents but, intuitively, negatively related to the distance from the market (Holloway et al 2005), which reflects again the issue of transaction costs in market participation, in this case transportation and communications costs. Omamo (1998) shows very neatly how distance to food markets affects households production decisions, with reduced access inducing greater reliance on consumption of own production and therefore a more limited ability to diversify into commercial, non-food crops.

Access to credit is a means by which the entrance barriers to certain economic activities, such as non-farm enterprises, can be overcome (Reardon et al 2001; Escobal 2001). Credit can also help overcome liquidity constraints which have been demonstrated to be linked to productivity constraints in agriculture (Foltz 2002; Feder et al 1990). Some studies, such as Khandker and Faruqee (1999) for Pakistan, have shown how small holders may obtain significantly greater returns to consumption from borrowing than medium to larger holders.

The importance of the joint benefits of assets must be highlighted since it has often been shown how the returns to a particular asset are greater if other complementary assets are also available to the household, in what has been referred to as "bundling of services." (Valdés and Mistiaen 2001; Dorward et al. 2003; Birdsall and Székely 2003; Pretty and Hine 2000). Although investments in individual assets can generate a positive impact for rural households, the impact may be greater and/or may not materialize *unless* access to multiple complementary assets is improved. For example, the ability of agricultural households to respond to commercial opportunities and benefit from farm-nonfarm linkages relies on access to skills, capital and input/output markets (Dorward et al., 2003).

The vast literature we have cursorily reviewed above essentially points to the microeconomic mechanisms through which access to assets, markets, services can have a positive impact on agricultural productivity and of the improvement of income levels of poor smallholders. Looking at the micro-macro connection, the positive association between economic growth and poverty reduction (Valdés and Foster 2005), has been shown to be diluted by inequality

in asset distribution. That is because inequality in asset distribution puts a break on aggregate growth, while also reducing the income growth of the poorest strata of the population disproportionately (Birdsall and Londoño 1997).

Keeping in mind this micro and macro evidence on the importance of access to assets and assets distribution for the income of the poor, we now turn to discuss cross-country evidence on the distribution of assets and agrarian markets in a sample of developing and transition countries.

III. The RIGA database and the analytical approach

The analysis presented in this paper utilizes the RIGA database, which is constructed from a pool of several dozen Living Standards Measurement Study (LSMS) and other multi-purpose household surveys made available by the World Bank through a joint project with FAO.[5] From this pool of possible surveys, the choice of particular countries was guided by the desire to ensure geographic coverage across the four principal development regions – Asia, Africa, Eastern Europe and Latin America, as well as adequate quality and sufficient comparability in codification and nomenclatures. Furthermore, an effort was made to include a number of IDA (International Development Association) countries as these represent developing countries with higher levels of poverty and are therefore of particular interest to the development and poverty reduction debate.

Using these criteria, survey data from the list of countries in Table 1 were utilized. While clearly not representative of all developing countries, the list does represent a significant range of countries and regions and has proved useful in providing insights into the fundamental aspects of livelihood strategies of rural households in the developing world. A more detailed description of the dataset can be found in Table AI.1 in Appendix I. In this paper most of the analysis is performed on a sub-sample of rural households that are engaged in agricultural production to any extent. These are approximately 85 to 100 percent of the rural sample, depending on the country (Davis, 2007).

Table 1. Countries included in the analysis

Eastern Europe	Africa	Latin America	Asia
Albania, 2005	Ghana, 1998	Guatemala, 2000	Bangladesh, 2000
Bulgaria, 2001	Madagascar, 1993	Ecuador, 1995	Indonesia, 2000
	Malawi, 2004	Nicaragua, 2001	Nepal, 1996
	Nigeria, 2004	Panama, 2003	Pakistan, 2001
			Vietnam, 1998

We analyze various dimensions of heterogeneity of access. A first dimension is across expenditure quintiles which serve as a proxy of well-being of rural households, thus allowing a comparison of access across poorer versus richer households. Comparable expenditure data, constructed using standard LSMS methodology, are available in all of the data sets.. A second

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[5] Details on the project and the dataset can be found at http://www.fao.org/es/ESA/riga/index_en.htm .

dimension of comparing households is by examining a particular asset to see if those with greater accumulation of that asset, such as land, have similar access to other assets or agrarian institutions. Finally, by virtue of examining data across a range of countries, we can also assess the heterogeneity of household variables across countries and regions.

In each of these cases, the objective is to identify the existence and degree of heterogeneity of access and establish conditions under which access varies. It should be noted, however, that in all of these comparisons establishing causality is difficult; what we are presenting are associations. Furthermore, it is also difficult to establish the reasons why heterogeneity exists in a particular context. As with any descriptive cross sectional analysis of this type, the inferences made in this paper serve to characterize heterogeneity of access, but cannot identify the factors which generate this heterogeneity. In particular we do not attempt to discriminate supply and demand side issues in access to assets and input markets.

IV. Household access to key assets

In this section, we examine the access of rural households to three key assets: i) land, ii) livestock and iii) infrastructure.

i. Land

Land is the asset that has historically been most closely linked to rural development. Policies for promoting rural development have often centred on providing access through a variety of types of land reform, under the assumption that land access is critical for agricultural production and thus food security and income generation for rural households. In this section, we examine land access by looking at ownership, the link between land ownership and expenditure quintile, and alternative mechanisms of access to land.

Most rural households have no land, or only small plots of land, as seen in Figure 5, which presents histograms of the different land ownership categories by country for each region. Landlessness is most prevalent in Latin America and Asia, reaching from 40 to over 60 percent of households, as can also be seen in Table 2. The prevalence in Ghana is also high, though we suspect that these numbers mask collective forms of land access which are not captured in this variable; we follow up on this suspicion below. Landlessness is least prevalent in Vietnam, Malawi and Albania, at around 10 percent. In some of these countries alternative forms of access to land are common, again which we discuss below.

Table 2. Percentage of rural households owning land, by expenditure quintiles

| | Percentage of Land-Owning Households | | | | | |
| | Expenditure Quintiles | | | | | |
	1	2	3	4	5	All
Africa						
Ghana 1998	30.9	32.4	38.5	37.8	33.6	34.6
Madagascar 1993	73.7	80.9	75.2	72.9	69.8	74.5
Malawi 2004	94.7	94.9	93.4	91.6	82.4	91.4
Nigeria 2004	78.7	73.3	68.5	62.0	55.2	67.5
Asia						
Bangladesh 2000	32.7	40.7	52.5	55.9	63.6	49.1
Indonesia 2000	44.3	48.7	43.5	40.4	37.4	42.8
Nepal 1996	76.0	79.8	79.9	79.1	81.2	79.2
Pakistan 2001	20.2	28.0	35.1	38.0	42.4	32.7
Vietnam 1998	91.8	93.3	90.7	90.8	84.5	90.2
Eastern Europe						
Albania 2005	91.5	91.9	95.8	95.0	95.4	93.9
Bulgaria 2001	34.1	61.7	76.1	78.9	75.4	65.2
Latin America						
Ecuador 1995	63.5	62.5	55.2	55.2	53.3	58.0
Guatemala 2000	62.7	59.9	53.4	44.8	38.0	51.8
Nicaragua 2001	45.8	44.1	45.4	40.4	33.7	41.9
Panama 2003	68.8	54.1	49.4	45.2	36.8	50.9

Not owning agricultural land does not necessarily represent a situation of disadvantage for rural households, as landlessness may signal either transition out of agriculture into higher return activities, or a land-constrained household desirous of producing agricultural output. Indeed, we find in Table 2 that the share of rural households that own land tends to decrease with increasing levels of household wealth. This is true in all four of the Latin American countries, as well as Nigeria and Indonesia. In the other three African countries land ownership is more or less constant across quintiles, as is also the case in Nepal, Vietnam and Albania. Only in Bangladesh, Pakistan and Bulgaria does the share of rural households owning agricultural land increase with expenditure quintile.

Landholdings in most countries are small, with the vast majority less then one hectare in size. A greater number of larger landholdings are found in Latin America and Africa, as reflected in Figure 1 and Table 3, the latter of which provides mean land ownership for all rural households and agricultural households along with a breakdown of ownership by expenditure quintiles. The size of average landholding varies from 0.2 hectares in Vietnam to around 6 hectares in Panama for all rural households and similarly for agricultural households with a higher value of nearly 8 hectares for Panama. Average land holdings are smallest in Asia and Eastern Europe and largest in Latin America most likely reflecting differences in population densities and, for transition countries in Eastern Europe, the specific patterns of decollectivisation followed by these two countries following the collapse of the socialist system.

Table 3. Land ownership (has), by expenditure quintiles

	Average Land Size (has, Rural Households)						Average Land Size (has, Agricultural Households)					
	Expenditure Quintiles						Expenditure Quintiles					
	1	2	3	4	5	All	1	2	3	4	5	All
Africa												
Ghana 1998	0.88	0.92	1.23	1.30	1.34	1.14	0.91	0.97	1.34	1.47	1.82	1.29
Madagascar 1993	0.90	1.19	1.05	1.18	1.40	1.14	0.92	1.21	1.11	1.26	1.51	1.20
Malawi 2004	1.21	1.42	1.57	1.63	1.67	1.50	1.24	1.45	1.62	1.69	1.85	1.57
Nigeria 2004	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asia												
Bangladesh 2000	0.12	0.20	0.28	0.44	0.73	0.35	0.15	0.24	0.33	0.54	0.84	0.43
Indonesia 2000	1.09	0.86	0.71	0.80	0.68	0.83	1.51	1.37	1.23	1.56	1.52	1.43
Nepal 1996	0.41	0.61	0.54	0.73	0.70	0.60	0.46	0.65	0.57	0.77	0.75	0.64
Pakistan 2001	0.47	0.57	0.85	1.05	1.55	0.90	0.73	0.84	1.19	1.45	2.11	1.28
Vietnam1998	0.15	0.19	0.20	0.21	0.27	0.20	0.15	0.19	0.21	0.21	0.27	0.21
Eastern Europe												
Albania 2005	0.68	0.71	0.84	0.85	0.96	0.81	0.72	0.73	0.87	0.88	0.99	0.84
Bulgaria 2001	0.44	0.56	0.75	0.64	0.96	0.67	0.81	0.66	0.74	0.75	1.12	0.82
Latin America												
Ecuador 1995	4.22	3.73	4.10	5.92	10.41	5.67	4.57	3.90	4.42	6.60	9.06	5.62
Guatemala 2000	1.70	1.99	1.61	1.26	2.97	1.91	1.81	2.07	1.77	1.42	3.74	2.12
Nicaragua 2001	3.62	4.77	7.87	5.35	7.52	5.81	3.87	5.16	8.38	5.88	8.51	6.33
Panama 2003	5.66	4.37	5.16	7.16	9.02	6.27	6.24	5.16	6.10	8.80	12.85	7.61
mean	*1.54*	*1.58*	*1.91*	*2.04*	*2.87*	*1.99*	*1.72*	*1.76*	*2.13*	*2.38*	*3.35*	*2.24*
max	*5.66*	*4.77*	*7.87*	*7.16*	*10.41*	*6.27*	*6.24*	*5.16*	*8.38*	*8.80*	*12.85*	*7.61*
min	*0.12*	*0.19*	*0.20*	*0.21*	*0.27*	*0.20*	*0.15*	*0.19*	*0.21*	*0.21*	*0.27*	*0.21*

Landholdings tend to be concentrated, although this varies by country and region. Table 4 presents the share of total land owned by each quintile of land owners (excluding the landless). Landholdings in the Latin American countries are the most concentrated, with between 70 and 80 percent of total land held by the top quintile of land owners. For most of the countries in Asia, around 60 percent of total land is held by the largest quintile (Indonesia is the exception, with 83 percent), while the African countries follow with around 55 percent. Albania is the country where land is most equitably distributed, with only 43 percent held by the top quintile.

Table 4. Percentage of land owned by each quintile of land owners

Percentage of land owned by each quintile of land owners

	Bottom 20%	2nd Quintile	3rd Quintile	4th Quintile	Top 20%
Africa					
Ghana 1998	1.6	6.1	11.9	20.6	59.8
Madagascar 1993	1.5	6.6	13.5	23.4	55.0
Malawi 2004	3.7	7.8	12.0	19.1	57.4
Nigeria 2004	NA	NA	NA	NA	NA
Asia					
Bangladesh 2000	1.8	5.4	10.7	19.6	62.5
Indonesia 2000	0.3	2.1	4.8	9.7	83.1
Nepal 1996	1.6	5.4	10.8	20.7	61.5
Pakistan 2001	2.3	5.9	10.9	20.5	60.4
Vietnam 1998	2.7	4.9	8.7	20.0	63.6
Eastern Europe					
Albania 2005	3.4	9.6	16.8	26.5	43.6
Bulgaria 2001	0.7	2.1	6.8	19.8	70.6
Latin America					
Ecuador 1995	0.3	1.7	4.4	11.6	82.1
Guatemala 2000	1.0	2.9	5.5	10.8	79.7
Nicaragua 2001	1.3	3.2	7.0	17.0	71.4
Panama 2003	0.1	1.0	3.7	11.7	83.5

Looking back at Table 3, there is generally a positive relationship between average size of land owned and welfare, although in Indonesia the poor own on average larger plots and in other cases it is apparent at the extremes but not in the central part of the welfare distribution (as in the four Latin American countries). This can be read as confirmation that for a number of these households, even if landed and to some extent involved in agriculture, assets other than land are proving more crucial in determining welfare levels.[6]

To get a sense of who in the distribution owns the greatest share of land in a given country, Figure 2 presents the relationship between expenditures levels and the share of total land owned, smoothed using a Lowess distribution. In all countries, the line is upward sloping indicating that wealthier agricultural households[7] own a greater share of total agricultural land than poorer households. In Asia, for example, the lower expenditure groups each own around 2-3% of total land while the highest groups own twice that amount, with particular concentration in Bangladesh[8]In Latin America, particularly sharp increases are seen at the higher end of the distribution suggesting greater land concentration among the wealthiest.

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[6] The fact that our land ownership variable does not account for differences in land quality can also be part of the explanation.

[7] Agricultural households are defined as those with non zero agricultural income.

[8] In Vietnam we classify as landowners those who have land classified in the survey as owned, allocated, auctioned, private land, or land of long term use.

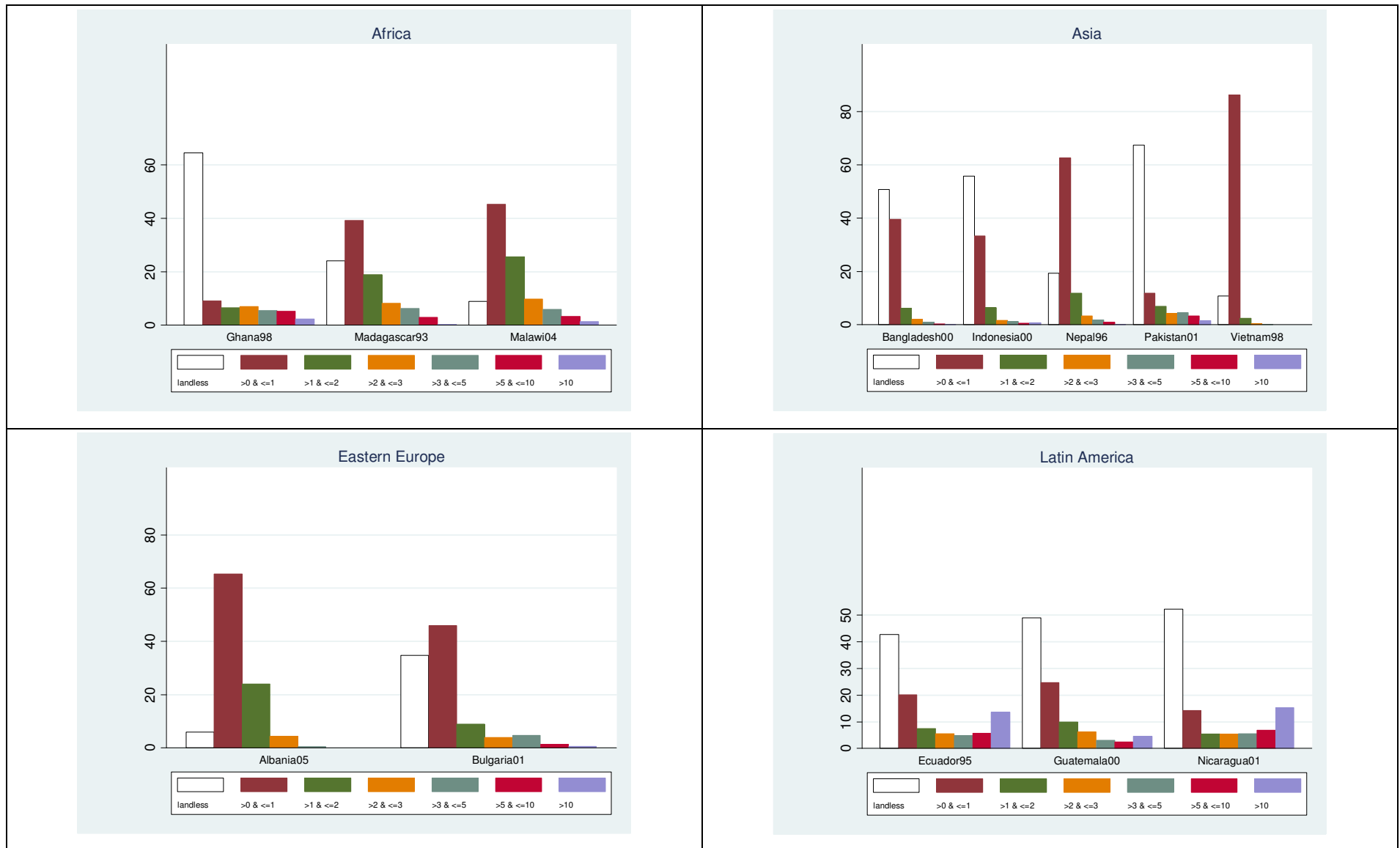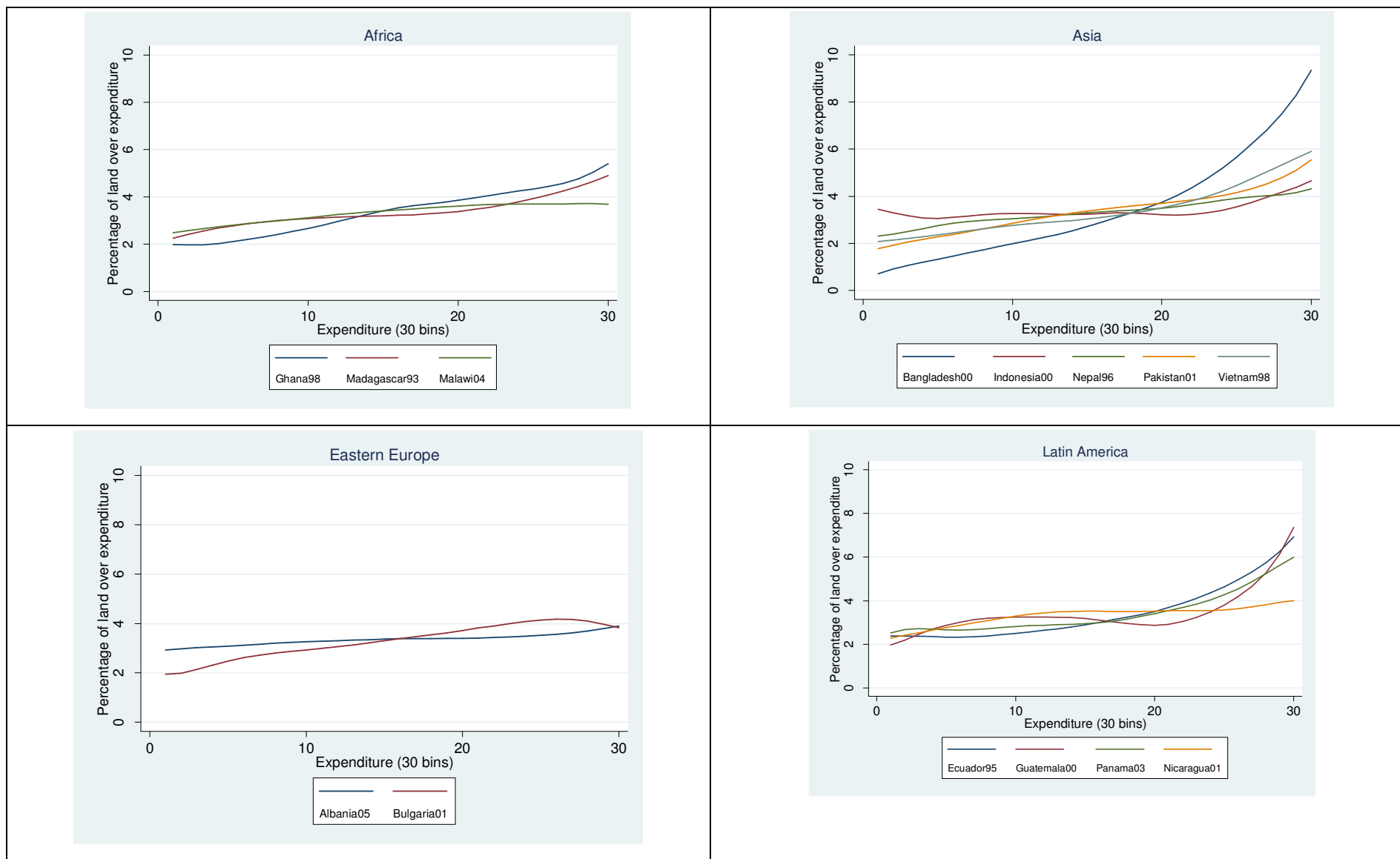**Figure 1. Land distribution, by region**

Figure 2. Land concentration by expenditure (30 bins), by region (Lowess distribution)

In addition to ownership, rural households access productive land through other forms of tenancy. These mechanisms may include land in exchange for payment (whether cash or in kind), or through reciprocity or traditional exchanges. We focus first on exchange for payment, which includes rental and sharecropping. Figures 3 and 4 below report the share of households by rural household land ownership quintile that, respectively, rent and sharecrop in and rent and sharecrop out land in the set of countries analyzed. For renting/sharecropping out, the landless category (category 0) is, of course, excluded.

As expected, renting in land and sharecropping are particularly widespread in South Asia, but the phenomenon is also significant in several African and Latin American countries. In Pakistan and Bangladesh, 15 and 27 percent of households, respectively, rent in land. In Africa, the total share is about 20 and 15 percent in Ghana and Malawi, and in Latin America 18 percent in Guatemala and 14 percent in Panama. Not only the landless rent or sharecrop. It is, however, the landless and the smaller land classes in particular that access land through these alternative forms of tenancy, although in some cases (Bangladesh and Nepal) this is more of an option for the households in the middle of the land distribution. Rental markets and sharecropping are thus an important avenue for smallholders to access more land and more income, but, depending on the country, are also used by households in the middle of the distribution.

Figure 3. Percentage of agricultural households that rent and/or sharecrop in land, by land ownership quintile
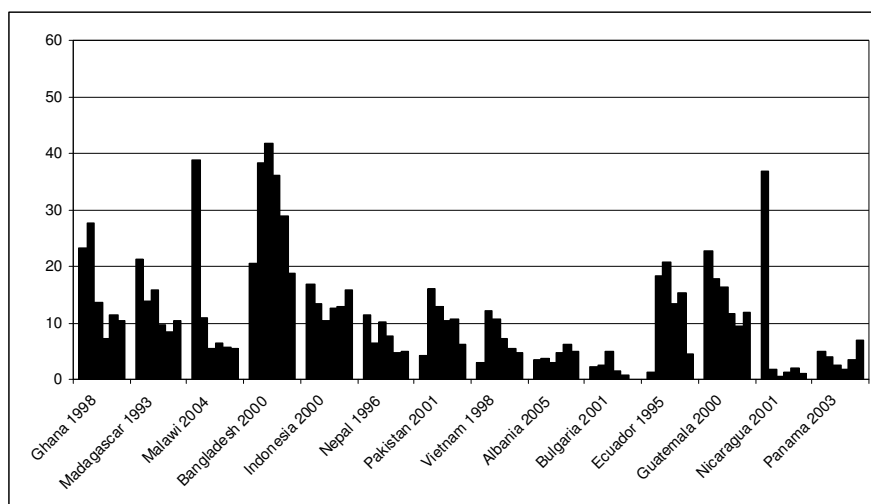
Renting and/or sharecropping land out, on the other hand, is generally associated with larger landholdings. There are, however, a few cases in which there appears to be more renting out among the smallest category than in the middle of the distribution. This may reflect an inability to gain economies of scale in production that push smallholders to rent out land, or if land is fragmented it may suggest some land is rented out while other is rented in. Taken together, this again suggests that land rental markets play an important role in reallocating land use towards smaller landholdings and may be allowing poorer farming households to put together more economically viable farm units.[9]

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[9] And, to the extent that an inverse farm size-productivity relationship holds, this may also be contributing to improving the productivity of the farm sector.

Figure 4. Percentage of agricultural households that rent and/or sharecrop out land, by land ownership quintile
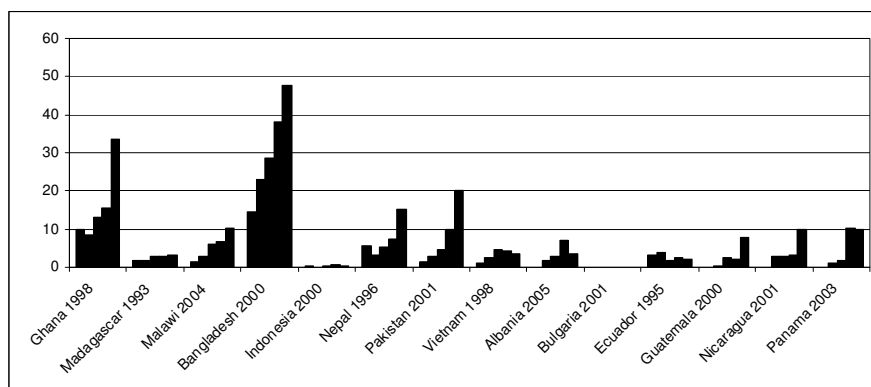
Mechanisms via reciprocity or traditional exchanges which do not involve payment, such as communal or village land or free exchanges from family or friends are also important. Figure 5 below reports the share of households by land ownership quintile that access land via non payment mechanisms. As was expected, these forms of access are particularly important in the African countries. In the case of Ghana, almost 60 percent of landless households had access to communal land, explaining, as we hypothesized earlier, the high share of landless among rural households in that country. Access via reciprocal or traditional exchange is also important for households in all land categories in Madagascar and Malawi.

Figure 5. Percentage of agricultural households that access land via reciprocal or traditional means, by land ownership quintile
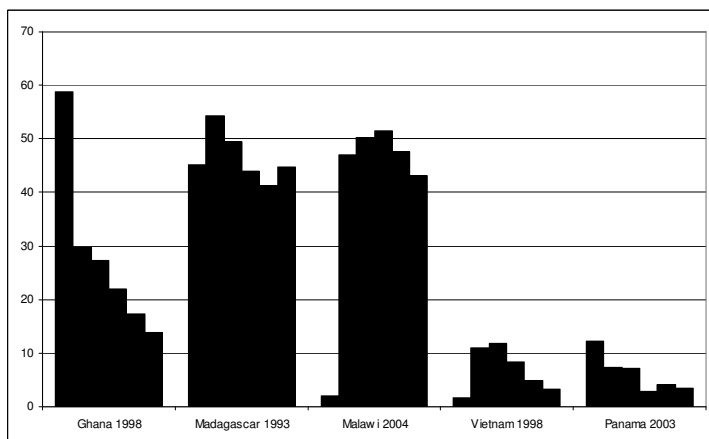
iv. Livestock

Livestock constitutes an asset that is widely owned by rural households in developing countries and performs a crucial role as a saving and risk management instrument, while at the same time contributing to the generation of income and to food security. Despite its importance, issues of access to livestock have not been quite as extensively researched as issues related to land and human capital, and there is a tendency to consider them important solely for particular population subgroups (herders and pastoralists), while focusing most of the analysis of agricultural livelihoods on crop activities.

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Table 5. Livestock holdings (TLU)

	Households owning livestock (%)	Livestock holdings (TLU)	Households owning cattle (%)	Cattle owned (#)	Among owners, livestock holdings (TLU)
Africa					
Ghana 1998	50.1	0.67	7.2	0.46	1.34
Madagascar 1993	76.7	1.56	33.4	2.34	2.04
Malawi 2004	62.8	0.32	4.9	0.21	0.51
Nigeria 2004	46.4	0.71	9.4	0.60	1.54
Asia					
Bangladesh 2000	61.7	0.53	36.8	0.89	0.86
Nepal 1996	88.4	1.73	80.1	2.97	1.96
Pakistan 2001	47.0	N/A	44.0	N/A	N/A
Vietnam 1998	82.1	1.09	34.2	0.60	1.33
Eastern Europe					
Albania 2005	84.1	1.52	65.7	1.17	1.81
Bulgaria 2001	68.2	0.51	20.6	0.31	0.75
Latin America					
Ecuador 1995	84.4	2.77	31.1	2.44	3.29
Guatemala 2000	70.2	0.93	11.0	0.75	1.32
Nicaragua 2001	55.3	2.18	22.9	2.45	3.95
Panama 2003	60.8	1.98	13.0	2.50	3.25

The data in Table 5 confirm the widespread ownership of livestock in the developing world. Between 46 and 85 percent of the rural households in the analyzed countries own some livestock such as cattle, horses, mules, goats, sheep or chickens. The type of livestock owned is however much more context specific; while in some countries (Nepal, Pakistan and to some extent Albania) most livestock owners own some cattle, in other countries (and notably in all our African countries) the bulk of herds are formed of smaller animals. To get a sense of overall ownership, we aggregate livestock into tropical livestock units (TLU), based on region-specific weights. Cattle, for example, have a value of around 0.7 compared to sheep and goats at 0.1 and chickens at 0.01.[10] As is the case for land holdings, livestock holdings on average tend to be small in size, ranging from .32 in Malawi to 2.77 in Ecuador. Even among livestock owners, holdings range from .51 in Malawi to almost 4 in Nicaragua. By region, they tend to be smaller in Africa and Asia, and larger in Latin America.

To get a sense of the distribution of livestock by wealth categories, Table 6 shows livestock ownership and holdings by expenditure quintile. As was the case with agricultural land, the share of households that own livestock is not necessarily positively related to well-being as measured by consumption expenditure. This is true only in Bangladesh, Pakistan and Bulgaria. In Latin America as well as Ghana and Nigeria, wealthier households are less likely than poorer households to own livestock. As also shown in the table, however, average holdings tend to increase with wealth, with the exception of Ghana, Nigeria, Vietnam and Albania.

While ownership of livestock is relatively evenly distributed, total livestock holdings are concentrated, both over livestock owners and wealth, and particularly in Latin America. Among the countries in this region, the top quintile of livestock owners (in terms of size of holdings) hold between 70 and 90 percent of total livestock, followed by the African countries, with between 65 and 75 percent. Herds are relatively less concentrated in the Asian and Eastern European countries, with around 50 percent. The particular concentration of livestock in Latin America is most evident in Figure 6, which presents the relationship between expenditure levels and the share of total livestock owned, using a Lowess distribution. Wealthier agricultural households also own a greater share of total livestock in

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[10] The regionally differentiated weights can be found in Table AII.1 in Appendix II.

Malawi, Madagascar and Bangladesh. Contrary to the land distribution by wealth in Figure 7, however, livestock are progressively distributed in a number of countries, including Ghana, Nigeria, Albania, Nepal and Vietnam.

Table 6. Percentage of households with livestock holdings, and size of holdings (TLU), by expenditure quintile

	Household Per Capita Expenditure Quintiles										Percentage of livestock owned by top 20% of livestock holders
	Rural HH with livestock (%)					Livestock holdings (TLU)					
	1	2	3	4	5	1	2	3	4	5	
Africa											
Ghana 1998	64.6	55.3	51.4	43.5	36.0	1.25	0.63	0.65	0.41	0.41	69.5
Madagascar 1993	73.7	81.0	79.3	76.5	73.2	1.09	1.41	1.62	1.85	1.84	73.9
Malawi 2004	56.6	62.1	67.3	67.1	61.1	0.21	0.25	0.34	0.40	0.40	74.5
Nigeria 2004	58.3	53.9	46.7	39.0	33.9	1.23	0.94	0.62	0.51	0.25	66.6
Asia											
Bangladesh 2000	55.1	57.7	64.6	64.3	66.5	0.34	0.43	0.55	0.66	0.67	51.9
Nepal 1996	89.0	90.9	88.3	87.8	86.1	1.74	1.82	1.60	1.82	1.69	42.3
Pakistan 2001	40.7	45.3	47.4	49.6	51.7	N/A	N/A	N/A	N/A	N/A	N/A
Vietnam 1998	85.3	87.0	83.1	81.6	73.5	1.12	1.22	1.13	1.12	0.86	50.9
Eastern Europe											
Albania 2005	85.3	84.9	82.9	85.1	82.4	1.67	1.62	1.52	1.51	1.30	49.2
Bulgaria 2001	39.2	68.0	78.4	77.7	77.7	0.20	0.48	0.61	0.67	0.60	51.2
Latin America											
Ecuador 1995	86.9	88.2	86.6	87.2	73.0	2.30	2.60	2.50	2.85	3.62	71.4
Guatemala 2000	74.4	76.9	71.1	69.8	58.9	0.54	0.58	0.65	0.59	2.28	78.3
Nicaragua 2001	58.6	60.6	60.9	53.5	42.8	0.67	1.54	2.00	2.84	3.87	77.6
Panama 2003	74.1	65.5	62.7	56.5	44.9	0.65	1.03	1.71	2.01	4.30	92.9

Figure 6. Livestock concentration across the expenditure distribution (30 bins), by region (Lowess distribution)
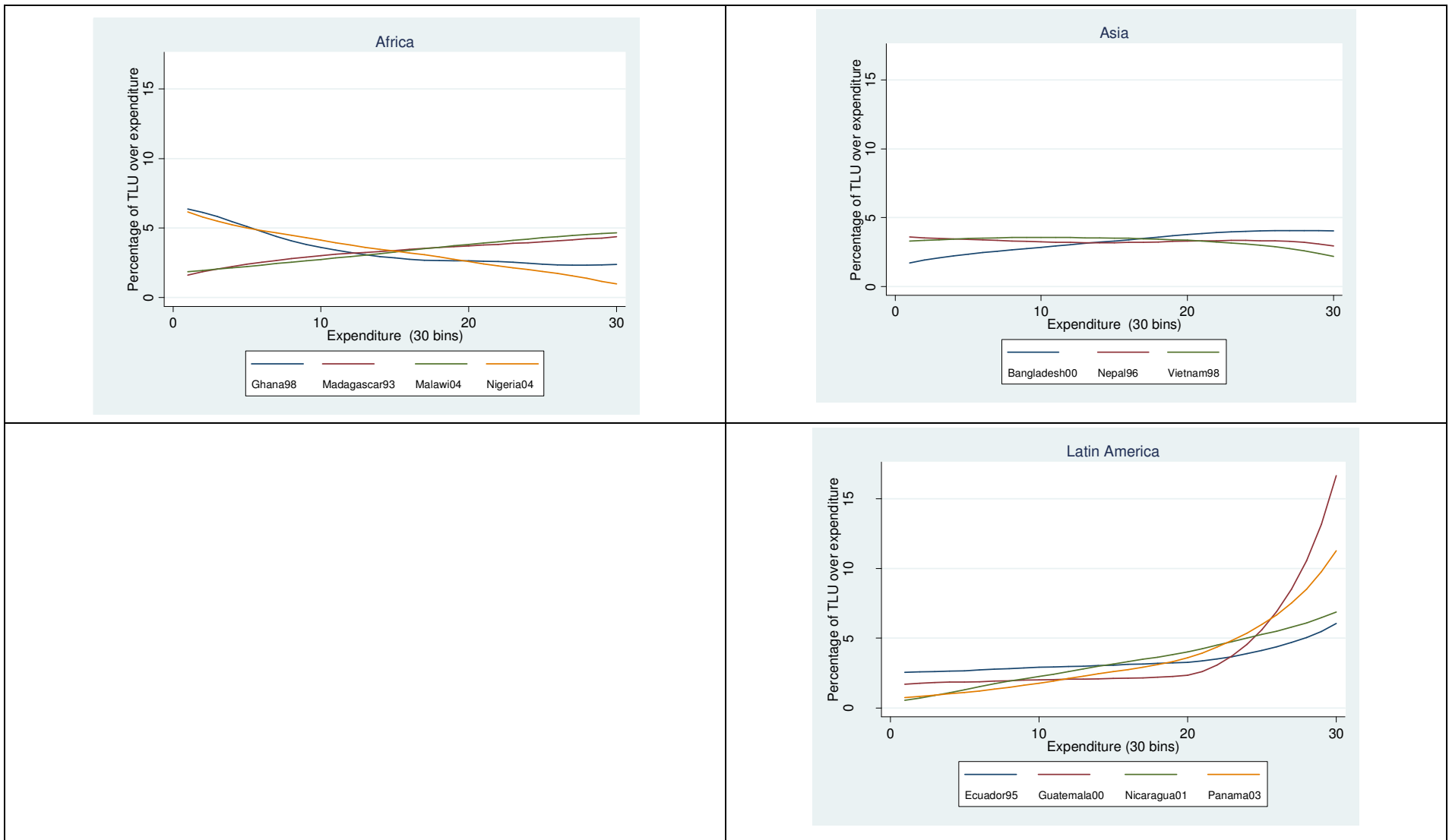
v. Infrastructure

Greater access to infrastructure is assumed to imply reduced time and distance to urban centres and facilitated access to markets. Households with greater access to electricity, water, communication, roads and other forms of infrastructure will have a broader range of economic opportunities compared to those with less access, who may be limited to agricultural activities for subsistence or near subsistence. Access to infrastructure, as a proxy for access to input and product markets, may also positively influence the type of agricultural activity towards more remunerative production technologies.

Table 7. Infrastructure index

	Infrastructure Index					
	Expenditure Quintiles					
	1	2	3	4	5	All
Africa						
Ghana 1998	-0.56	-0.22	0.01	0.30	0.46	0.00
Madagascar 1993	-0.20	-0.17	0.02	0.09	0.26	0.00
Malawi 2004	-0.18	-0.16	-0.11	0.00	0.45	0.00
Nigeria 2004	-0.06	-0.03	-0.01	0.03	0.07	0.00
Asia						
Bangladesh 2000	-0.33	-0.23	-0.08	0.07	0.57	0.00
Indonesia 2000	-0.35	-0.15	0.01	0.11	0.38	0.00
Nepal 1996	-0.30	-0.27	-0.19	0.12	0.64	0.00
Pakistan 2001	-0.25	-0.15	-0.04	0.08	0.36	0.00
Vietnam 1998	-0.42	-0.12	-0.05	0.18	0.41	0.00
Eastern Europe						
Albania 2005	-0.41	-0.18	0.01	0.19	0.40	0.00
Bulgaria 2001	-0.59	-0.08	0.07	0.21	0.40	0.00
Latin America						
Ecuador 1995	-0.04	-0.03	0.01	0.04	0.03	0.00
Guatemala 2000	-0.40	-0.22	0.00	0.06	0.57	0.00
Nicaragua 2001	-0.35	-0.11	-0.08	0.10	0.43	0.00
Panama 2003	-0.91	-0.41	0.08	0.32	0.93	0.00

The difficulty in examining infrastructure is in identifying a measure comparable across countries. While most surveys include questions on infrastructure and distances to urban areas and key services, few of the variables are comparable. To address this issue, an infrastructure access index, including both public goods (electricity, telephone, etc.) and distance to infrastructure (schools, health centres, towns, etc.) was created using principal components analysis (following Filmer and Pritchett, 2001). The variables included in the index vary by country depending on data availability. Since infrastructure is generally linked to proximity to urban areas, the measure captures both jointly. In Table 7, the infrastructure index, which is normalized to have a mean zero in all cases, is presented for each country, by expenditure quintile. The higher the value of the index, the greater is the access to infrastructure. As can be seen in the table, not surprisingly, access to infrastructure increases with wealth, illustrating the constraints in terms of opportunities and services for the poor in all of the countries of the RIGA dataset.

V. The utilization of productive inputs

Access to both input and output markets, and the economic opportunities they offer, is a key factor for households which depend on agricultural and other self employment activities for their livelihoods. Ideally one would hope to have information on access to markets, exogenous to the household decision to participate in a given market. This decision is typically influenced by household characteristics, such as its asset position, as well as the

economic context. Unfortunately, such a measure is not available, so the best proxy is whether they actually did purchase and sell in input and output markets. This presumes that non use implies non access which is not necessarily the case. It does, however, provide a reasonable approximation for access, and comparison across land ownership quintile allows an assessment of how access varies with farm size.

In this section, we focus on looking at access to input markets for agricultural households. Four inputs in particular are considered: i) fertilizer, ii) pesticides, iii) mechanisation, and iv) hiring of labour. For agricultural households in each country, Tables 8 and 9 present data on the share of households that use the four inputs, both overall and by land ownership category. These categories include the landless (category 0) that own no land but do earn income from some agricultural activity and then the five quintiles of land ownership (categories 1-5) with 1 being the smallest landholding category and 5 the largest. Note that we only have information on whether fertilizers were used, and not how much was used, which could lead to an underestimation in terms of differences in actual fertilizer use among households.

Overall the results suggest a wide range of access to inputs across the countries studied. For fertiliser use, we see generally lower prevalence of use in Africa compared to Asia and Eastern Europe, except in Malawi where the Starter Pack program and tobacco production led to raised input use. Similarly, the countries of Latin America have lower use, with the exception of Guatemala where the production of non-traditional exports may have influenced results. Fertilizer use is highest in Albania and Vietnam, covering almost 90 percent of households. Few significant differences are evident in the use of fertilizers between the smallest and largest landholders, not surprisingly since no distinction is made between organic and inorganic sources of fertilizer. A lower share of landless agricultural households, however, in most countries used fertilizers.

Pesticide use appears generally lower than fertiliser use but varies widely by country and within regions, responding to climate, policy and the nature of pesticide products. Vietnam and Albania again have the highest prevalence of use, with 81 and 51 percent of agricultural households, respectively, while only 3 percent of agricultural households in Malawi used pesticides. A consistent one third of the agricultural households in each of the Latin American countries also used pesticides. Much larger variation among small and larger landholders is evident for almost all of the countries, however, then in the case of fertilizer. Again this is not surprising, since pesticides nearly always involve a monetary payment. One exception is Vietnam, where use is over 80 percent in all categories, suggesting that government policy may be playing a role. Finally, with the exception of Latin America, very few landless agricultural households used pesticides.

Table 8. Utilization of productive inputs: fertilizer and pesticides, by land quintiles

| | Share (%) of agricultural households using fertiliser | | | | | | |
| | Land Quintiles | | | | | | |
	0	1	2	3	4	5	All
Africa							
Ghana 1998	20.6	24.9	18.8	23.0	24.8	23.1	21.6
Madagascar 1993	12.7	24.6	19.0	13.0	11.1	13.1	15.5
Malawi 2004	51.1	56.7	63.5	71.0	73.1	78.9	67.6
Asia							
Bangladesh 2000	29.1	73.3	86.4	88.3	88.2	89.0	62.2
Indonesia 2000	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nepal 1996	30.2	49.6	56.3	59.5	65.6	65.4	55.2
Pakistan 2001	27.0	77.9	84.4	86.9	88.1	88.6	54.1
Vietnam 1998	12.9	96.6	96.8	95.1	95.4	96.3	89.1
Eastern Europe							
Albania 2005	20.5	79.1	85.0	92.1	91.1	95.2	87.7
Bulgaria 2001	7.0	58.1	65.7	69.1	64.5	55.2	53.4
Latin America							
Ecuador 1995	19.4	16.6	37.0	44.9	33.1	26.7	27.9
Guatemala 2000	39.1	85.9	87.8	85.7	86.2	71.1	64.6
Nicaragua 2001	23.4	40.6	36.8	40.2	36.8	39.6	30.3
Panama 2003	30.2	20.5	30.9	31.3	30.2	34.4	29.4

| | Share (%) of agricultural households using pesticides | | | | | | |
| | Land Quintiles | | | | | | |
	0	1	2	3	4	5	All
Africa							
Ghana 1998	12.9	18.4	18.5	21.4	30.8	46.2	18.0
Madagascar 1993	12.4	9.0	11.1	13.0	10.3	12.8	11.5
Malawi 2004	2.4	0.7	2.1	3.2	3.7	7.4	3.3
Asia							
Bangladesh 2000	16.6	44.6	54.4	62.2	63.5	71.5	41.8
Indonesia 2000	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nepal 1996	0.9	3.4	4.1	8.3	13.1	15.2	7.8
Pakistan 2001	15.8	33.6	43.8	54.6	62.4	66.5	32.7
Vietnam 1998	7.5	85.2	87.6	88.4	87.3	91.9	81.1
Eastern Europe							
Albania 2005	5.1	33.0	38.2	47.1	57.5	71.8	50.9
Bulgaria 2001	1.8	12.0	26.5	27.6	31.5	24.1	20.5
Latin America							
Ecuador 1995	22.4	20.6	39.8	48.2	46.8	39.7	33.5
Guatemala 2000	28.4	22.2	30.1	31.1	50.0	59.8	34.2
Nicaragua 2001	23.5	38.0	42.3	51.3	43.5	65.2	34.1
Panama 2003	30.9	12.4	24.7	25.8	34.7	40.6	27.3

Mechanization—which is defined as using an input that uses a motor of some form— is limited among the agricultural households in the countries of the RIGA dataset, reaching over 20 percent in only 5 countries (Bulgaria, Nicaragua, Ecuador, Vietnam and Panama). The use of mechanisation, however, shows the clearest influence of land size on input use. In every country greater land size is associated with greater mechanisation. These general results, of course, may be due to the fact that larger farms substitute capital for labour since they are likely to have lower labour to land ratios. Alternatively, it could indicate a lack of access of smallholders who cannot afford to pay for access to mechanical inputs or lack access to necessary credit, as mechanization typically requires a monetary payment.

The share of households that hire in agricultural labour is more evenly distributed across countries, ranging from around 20 to 40 percent of agricultural households in most countries, with the exception of Ghana, where two-thirds of households hired in labour. As expected, the hiring in of agricultural labour increases with land size in most countries. This is particularly true in the Latin American and Asian countries, while in the Eastern European countries agricultural labour markets are practically non existent.

Table 9. Utilization of productive inputs: mechanisation and hired labour, by land quintiles

| | Share (%) of agricultural households using mechanisation | | | | | | |
| | Land Quintiles | | | | | | |
	0	1	2	3	4	5	All
Africa							
Ghana 1998	2.2	3.4	2.3	3.4	6.1	13.8	3.5
Madagascar 1993	9.1	10.2	14.4	18.6	27.6	32.0	17.5
Malawi 2004	6.4	1.2	1.2	2.4	4.5	6.8	3.3
Asia							
Bangladesh 2000	0.8	1.0	4.5	4.7	10.0	20.0	5.1
Indonesia 2000	0.5	2.7	4.0	4.2	4.2	10.9	2.4
Nepal 1996	0.5	1.6	1.9	3.9	8.2	28.7	7.9
Pakistan 2001	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vietnam 1998	1.6	16.2	23.4	21.5	23.7	33.5	21.3
Eastern Europe							
Albania 2005	8.6	6.2	17.1	16.4	24.7	29.4	19.8
Bulgaria 2001	17.5	16.2	30.4	40.7	46.8	51.7	33.4
Latin America							
Ecuador 1995	10.9	11.9	23.2	31.7	38.7	59.3	24.3
Guatemala 2000	4.5	13.4	8.3	13.1	13.3	17.6	9.4
Nicaragua 2001	14.6	35.5	41.0	55.8	56.0	71.8	30.9
Panama 2003	6.7	10.7	20.8	28.2	39.5	62.4	21.1

| | Share (%) of agricultural households hiring labour | | | | | | |
| | Land Quintiles | | | | | | |
	0	1	2	3	4	5	All
Africa							
Ghana 1998	64.0	68.2	61.4	70.8	78.5	88.2	67.5
Madagascar 1993	32.8	41.1	39.7	34.9	34.9	45.2	37.6
Malawi 2004	34.7	15.4	18.1	20.7	26.4	31.6	23.0
Asia							
Bangladesh 2000	18.6	38.6	59.6	69.4	73.8	74.9	44.9
Indonesia 2000	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nepal 1996	22.7	21.9	32.2	34.1	45.4	60.3	37.5
Pakistan 2001	15.4	16.8	27.7	46.1	62.3	67.2	28.6
Vietnam 1998	1.6	16.2	23.4	21.5	23.7	33.5	21.3
Eastern Europe							
Albania 2005	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bulgaria 2001	1.8	0.0	2.0	0.8	1.6	4.6	1.6
Latin America							
Ecuador 1995	29.9	10.9	19.4	33.9	44.7	50.5	30.8
Guatemala 2000	18.7	33.0	43.3	40.2	45.8	55.1	32.8
Nicaragua 2001	6.4	8.8	13.8	22.6	24.8	26.8	12.0
Panama 2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A

VI. Access to product markets

Moving from input to output markets, in Table 10 the share of agricultural households having made any sale of an agricultural (crop or livestock) product is presented both overall and across expenditure quintiles. The results show that in general about 70 percent of rural households participate in some sort of market for agricultural output. This varies though across countries, with lower rates for countries where non-agricultural activities may dominate. In many cases, particularly in Africa (Ghana, Madagascar and Nigeria) and Latin America (Ecuador, Guatemala and Panama) the poorest quintile tends to participate more in output markets suggesting that even the poor have access to output markets. In Asia and Eastern Europe, the poor seem to have less access except in Vietnam. Overall, the results do not show dramatic differences between the different categories. The results may be deceptive, however, since it may be the case that those with higher income have chosen not to produce for the market since there are better opportunities for them, such as non-agricultural activities, while those at the bottom of the distribution are excluded because of production or market constraints.

Table 10. Output market participation, by expenditure quintile

| | Percentage of HHs Selling Any Agricultural Production | | | | | |
| | Expenditure Quintiles | | | | | |
	1	2	3	4	5	All
Africa						
Ghana 1998	81.0	76.7	73.5	66.1	55.6	70.6
Madagascar 1993	95.6	98.1	94.1	93.6	89.9	94.3
Malawi 2004	63.7	71.0	74.0	73.7	69.2	70.3
Nigeria 2004	73.5	72.3	71.4	70.7	62.9	70.2
Asia						
Bangladesh 2000	65.3	74.1	79.9	77.8	80.5	75.5
Indonesia 2000	N/A	N/A	N/A	N/A	N/A	N/A
Nepal 1996	59.4	69.7	71.9	76.1	68.5	69.1
Pakistan 2001	45.7	50.8	53.2	54.5	56.6	52.1
Vietnam 1998	93.3	93.7	92.4	92.8	87.0	91.8
Eastern Europe						
Albania 2005	74.0	79.1	80.1	81.2	78.2	78.5
Bulgaria 2001	11.4	30.9	32.4	32.6	34.3	28.3
Latin America						
Ecuador 1995	62.0	68.0	65.1	60.0	52.9	61.6
Guatemala 2000	58.6	67.3	58.5	53.5	44.8	56.5
Nicaragua 2001	79.5	82.2	84.3	77.5	77.1	80.1
Panama 2003	57.5	49.0	47.2	48.1	43.0	49.0

In Figure 7, we look more closely at the 'depth' of this participation, by plotting kernel densities of the share of agricultural output sold by agricultural households. The focus is on agricultural households in the different land categories, including the top quintile of land owners the bottom quintile, and when relevant, the landless. These categories are included to get a sense of whether market integration is linked to land ownership. In general, a very mixed picture emerges. In some countries (Ghana and Panama) most farmers appear to be concentrated at the left hand of the distribution, selling little or none of their produce, while a very limited number appears to be outright commercial farmers whose production is largely for sale. In other countries such as such as Pakistan, Vietnam and Nicaragua, on the other hand, most of farm output seems to be sold through the market, even though there is still a large share of households that sell only 50 percent or less of their produce. Between these two are those with a more uniform distribution of sellers (Bangladesh and Bulgaria) and one in which most tend to sell about half of their produce (Albania and Madagascar). In terms of land categories, the distributions across categories tend to mirror each other, although in almost all countries agricultural households with larger land holdings sell a greater share of agricultural output (the curve is shifted to the right) than those in the bottom land quintile and the landless. Considering by expenditure quintile (Figure 8), the poorest and wealthiest agricultural households still tend to mirror each other. However, in the case of greater wealth, only the Latin American countries and Vietnam show a shift to the right of greater market participation.

Figure 7. Distribution of share of agricultural production sold, by 1st and 5th land ownership quintiles and landless (kernel density)
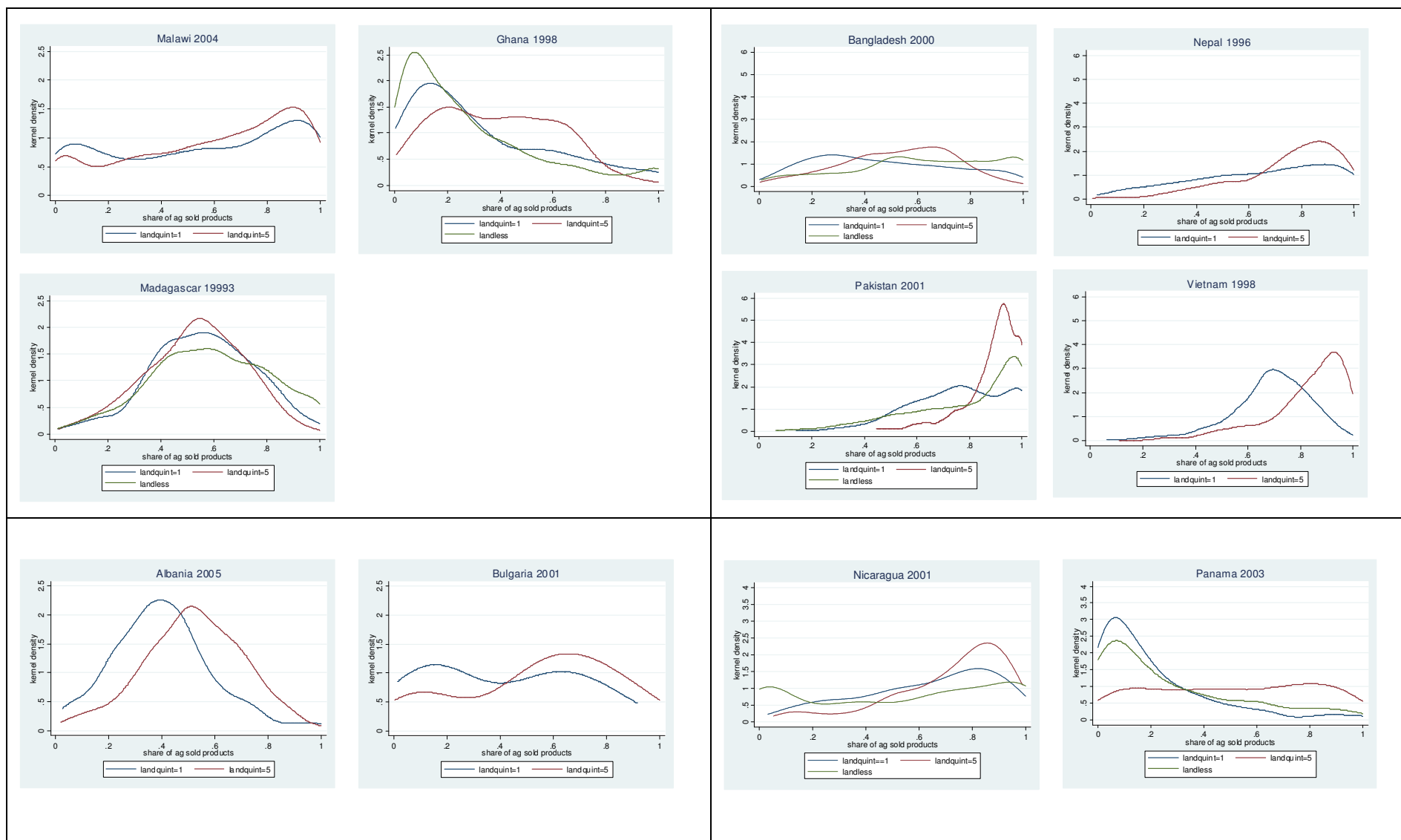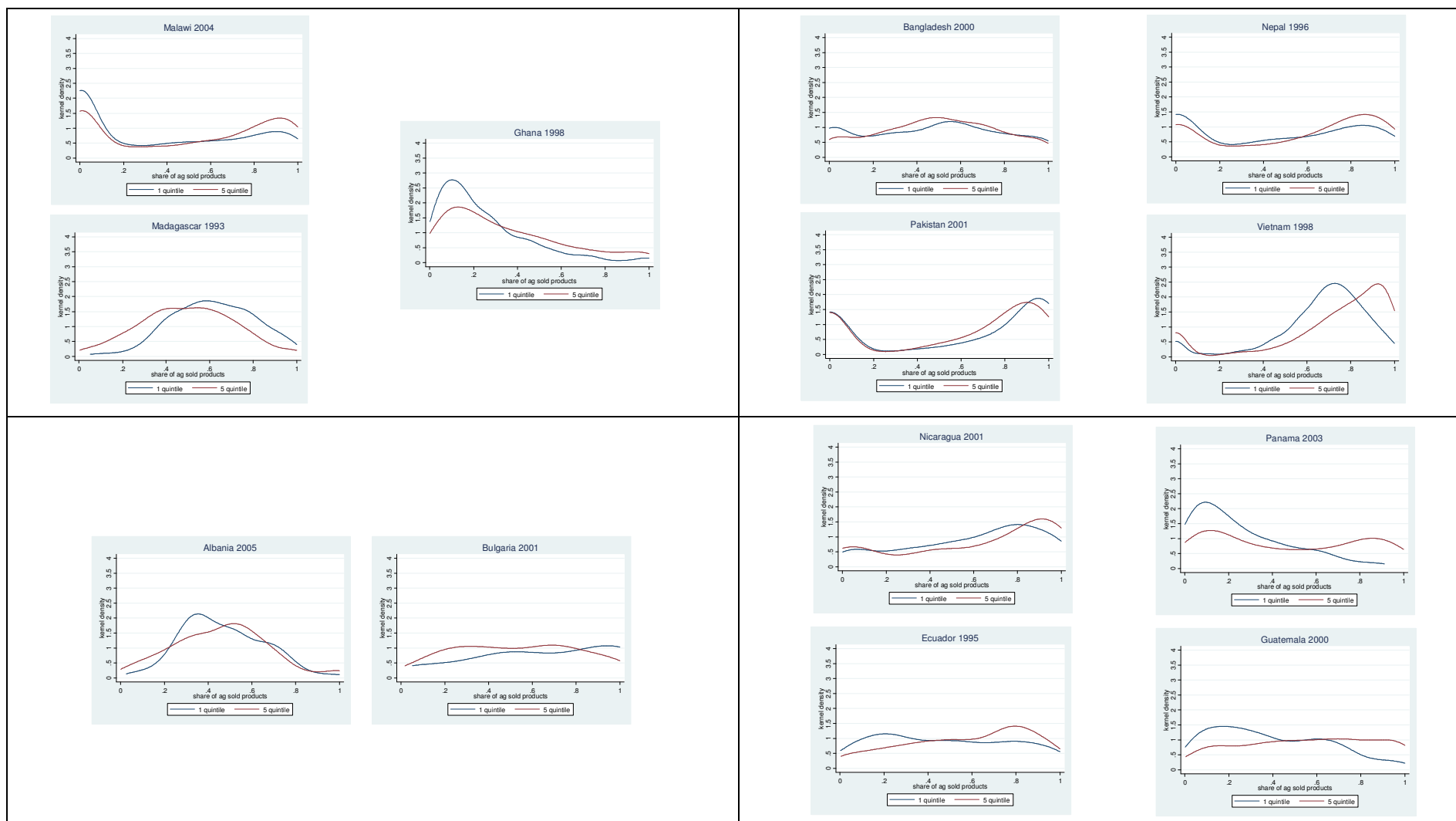
Figure 8. Distribution of share of agricultural production sold, by 1st and 5th expenditure quintiles (kernel density)

Looking at the concentration of volume of sales among households that participate in agricultural output markets, we find concentration among the largest sellers. Table 11 identifies the share of the total value of marketed agricultural production which corresponds to quintiles of sellers, that is, quintiles based on a ranking of agricultural households by value of production sold. With exception of Madagascar, Pakistan and Albania, more then 50 percent of the value of total marketed production corresponds to the top quintile of sellers. The value of sales are particularly concentrated among the Latin American countries, and Bulgaria has the highest concentration overall, at 90 percent.

Table 11. Concentration of value of marketed production, by quintile of value

Percentage of value of total marketed of agricultural production, by quintile of value sold

	Bottom Quintile of Sellers	2nd Quintile of Sellers	3rd Quintile of Sellers	4th Quintile of Sellers	Top Quintile of Sellers
Africa					
Ghana 1998	1.2	4.2	9.2	19.3	66.2
Madagascar 1993	4.5	10.7	16.0	24.3	44.4
Malawi 2004	0.9	3.7	9.0	19.8	66.5
Nigeria 2004	1.6	5.4	11.6	22.7	58.7
Asia					
Bangladesh 2000	1.0	4.6	11.1	22.2	61.1
Indonesia 2000	2.3	6.7	12.4	22.5	56.1
Nepal 1996	1.7	6.1	13.0	24.3	55.0
Pakistan 2001	2.7	7.6	14.4	25.3	49.9
Vietnam 1998	3.3	8.8	14.7	22.8	50.3
Eastern Europe					
Albania 2005	4.1	9.6	15.9	25.0	45.4
Bulgaria 2001	0.2	1.3	2.7	5.2	90.6
Latin America					
Ecuador 1995	0.8	3.9	9.7	21.9	63.8
Guatemala 2000	0.9	3.7	8.6	19.0	67.8
Nicaragua 2001	0.0	1.7	6.9	18.6	72.8
Panama 2003	0.3	1.3	3.8	12.2	82.4

The total value of sales is not concentrated by size of land holdings, however. Table 12 shows the percentage of total value of agricultural sales, as well as the total value of all agricultural production, by land quintile. Here, the largest quintile of landholders accounts for between 17 and 45 percent of the total value of production, with the largest concentration in Panama. The value of total agricultural production is even less concentrated; in most countries the largest quintile of landholders accounts for between 20 and 29 percent of the total value of agricultural production. On the other hand, landless households contribute an important share of the value of marketed and overall agricultural production in a number of countries, and in particular Ghana, Pakistan and Guatemala.

Table 12. Concentration of value of marketed and total production, by land quintile

| | Percentage of total value of marketed agricultural production | | | | | | Percentage of total value of agricultural production | | | | | |
| | Land Quintiles | | | | | | Land Quintiles | | | | | |
	Landless	1	2	3	4	5	Landless	1	2	3	4	5
Africa												
Ghana 1998	46.5	10.6	6.2	7.5	12.0	17.2	52.9	9.4	6.1	7.6	10.7	13.2
Madagascar 1993	15.2	13.8	16.1	18.3	17.8	18.8	21.4	12.4	18.9	15.3	14.7	17.3
Malawi 2004	3.9	5.0	12.4	15.1	25.4	38.2	4.3	12.4	15.3	17.2	23.2	27.6
Asia												
Bangladesh 2000	17.6	7.6	11.2	13.8	21.2	28.6	17.7	8.1	12.1	14.8	21.1	26.3
Indonesia 2000	15.7	8.4	11.6	19.9	20.5	23.9	15.7	8.4	11.6	19.9	20.5	23.9
Nepal 1996	7.0	8.7	12.8	14.9	25.7	31.0	7.1	9.6	13.9	15.8	24.7	29.0
Pakistan 2001	36.3	4.6	7.1	13.8	16.2	22.0	37.2	5.6	7.5	13.7	15.5	20.5
Vietnam 1998	1.9	10.9	16.1	17.2	21.9	31.9	2.1	12.1	17.0	18.2	21.2	29.3
Eastern Europe												
Albania 2005	0.7	9.2	12.1	20.9	23.0	34.1	1.1	12.5	14.5	21.0	21.9	29.0
Bulgaria 2001	2.7	1.0	1.7	22.7	42.3	29.5	4.0	3.1	3.9	23.6	38.6	26.8
Latin America												
Ecuador 1995	17.3	4.8	11.1	16.0	21.6	29.1	17.2	6.7	14.1	15.6	20.8	25.6
Guatemala 2000	24.6	5.4	8.1	11.1	19.8	31.0	26.7	6.1	9.4	12.8	19.0	25.9
Nicaragua 2001	19.6	7.5	11.7	15.5	20.8	25.0	21.3	8.2	12.0	14.9	20.4	23.2
Panama 2003	14.4	2.4	4.7	14.4	19.5	44.7	21.5	5.9	9.1	16.5	18.4	28.7

Similarly, the total value of sales is not concentrated by the wealth status of agricultural households. Table 13 shows the percentage of total value of marketed and overall agricultural production by expenditure quintile. With the exception of Bulgaria, the wealthiest 20 percent of agricultural households accounts for only 20 to 30 percent of the value of marketed production, and with the additional exception of Madagascar, for only 15 to 30 percent of overall agricultural production. Conversely, again with the exception of Bulgaria, the bottom 20 percent of households account for approximately 10 to 20 percent of the value of overall agricultural production. Clearly, the poor are responsible for an important part of agricultural production in these countries.

Table 13. Concentration of value of marketed and total production, by expenditure quintile

| | Percentage of total value of marketed agricultural production | | | | | Percentage of total value of agricultural production | | | | |
| | Expenditure Quintiles | | | | | Expenditure Quintiles | | | | |
	1	2	3	4	5	1	2	3	4	5
Africa										
Ghana 1998	13.5	22.6	23.7	21.9	18.4	18.3	22.0	22.9	20.3	16.5
Madagascar 1993	14.8	19.5	21.3	21.3	23.2	10.7	15.1	17.4	17.8	39.0
Malawi 2004	11.9	16.8	20.1	25.6	25.6	13.7	20.6	19.2	23.3	23.3
Nigeria 2004	17.7	20.8	22.2	21.4	18.1	20.7	23.3	22.6	19.5	13.8
Asia										
Bangladesh 2000	10.8	16.2	21.7	25.2	26.1	11.3	16.5	21.6	25.0	25.6
Indonesia 2000	14.7	20.2	21.6	22.0	21.4	14.7	20.2	21.6	22.0	21.4
Nepal 1996	12.5	18.4	18.4	24.9	25.8	13.1	18.7	18.7	24.1	25.5
Pakistan 2001	16.7	18.9	21.3	20.7	22.3	16.0	18.9	21.2	21.1	22.8
Vietnam 1998	10.2	15.8	20.0	23.5	30.5	11.4	16.6	20.4	23.1	28.5
Eastern Europe										
Albania 2005	18.9	19.6	21.4	20.9	19.2	18.3	19.9	21.1	20.9	19.9
Bulgaria 2001	3.6	23.8	6.5	5.5	60.6	4.2	22.5	11.7	9.7	51.8
Latin America										
Ecuador 1995	13.1	16.8	18.7	27.2	24.2	14.8	17.7	18.6	25.3	23.7
Guatemala 2000	14.9	21.0	22.0	20.2	21.9	17.9	22.0	21.7	20.6	17.8
Nicaragua 2001	10.5	19.7	21.5	22.4	25.9	11.9	19.6	21.5	22.6	24.5
Panama 2003	9.3	12.7	17.5	22.6	37.9	19.8	17.5	19.5	19.7	23.5

VII. Agrarian support for producers

Given the pervasiveness of incomplete markets in rural areas, the ability of agricultural households to use assets efficiently is linked to the support available to them as producers. Two key types of support are examined in this section: technical assistance and credit. Historically, both have often been provided by governments through agricultural extension agencies and government supported agrarian development banks. More recently, there has been a withdrawal of the state from providing this type of support, particularly credit which

along with being burdensome on budgets has also been plagued with inefficiency and management problems.

Figure 10. Percentage of agricultural households receiving technical assistance, by land category
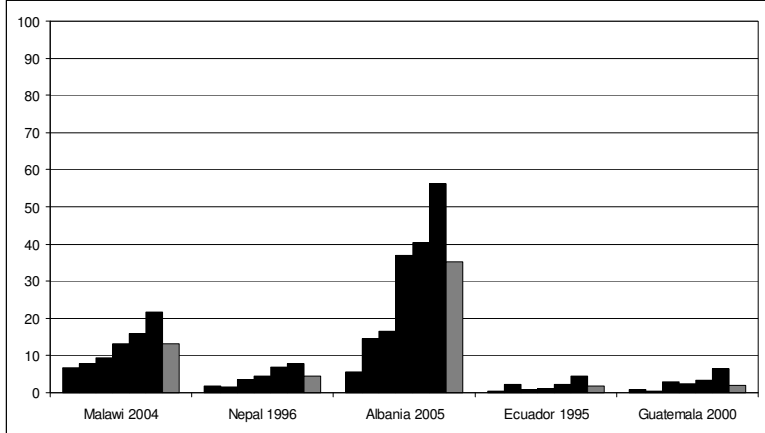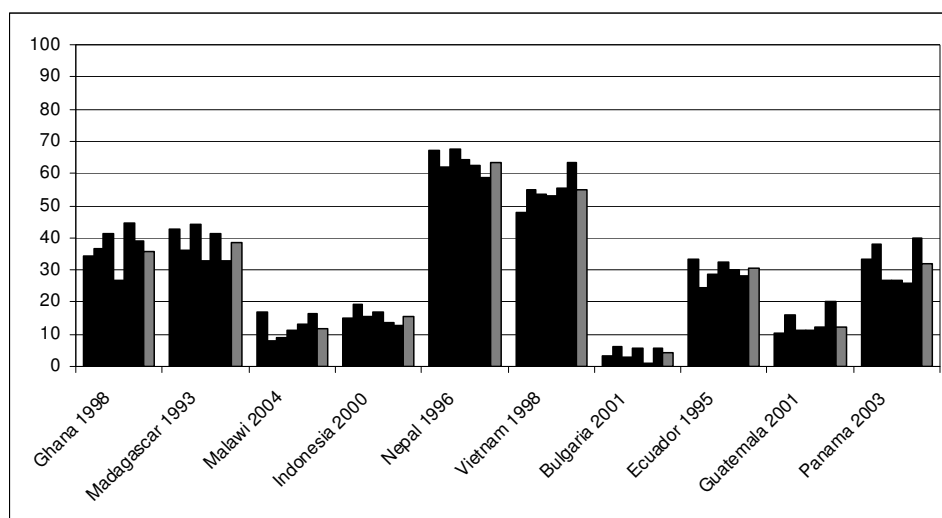

Note: Black represents the six land categories (from left to right landless and the five land quintiles) while grey represents overall access.

Data on technical assistance are limited to only five countries, presented in Figure 10. The dark bars represent the land categories noted in the previous section and the grey bar overall access. In general, technical assistance levels are low with no more than a third of households receiving assistance, and for Nepal, Guatemala and Ecuador less than five percent of households received technical assistance. The probability of receiving technical assistance is significantly higher among large landholders, in all countries. The results, while limited to five countries, suggest a critical lack of technical assistance, and that in particular public and private providers of technical assistance are failing to cater to poorer, smaller farmers.

Ideally, to get a sense of credit access, data on whether households demanded credit, or an additional amount of credit under the same terms and conditions, would be used. Unfortunately, only in a small subset of surveys are such detailed questions available. For reasons of comparability, therefore, the simple question of whether households receive credit from any source is used in this analysis. This at least provides a sense of the variation in access across countries and land/expenditure categories. Both land and expenditure categories are considered since credit can be considered a function of each. The use of credit (including loans from family members and relatives), is on average no more than 40 percent of agricultural households and in most countries no more than about one in ten agricultural households have access to credit (Figures 11 and 12). In several countries the use of credit appears to be more strongly related to the income level than to land ownership.

Figure 11. Percentage of agricultural households using credit, by land category

Note: Black represents the six land categories (from left to right landless and the five land quintiles) while grey represents overall access.

Figure 12. Percentage of agricultural households using credit, by expenditure quintile
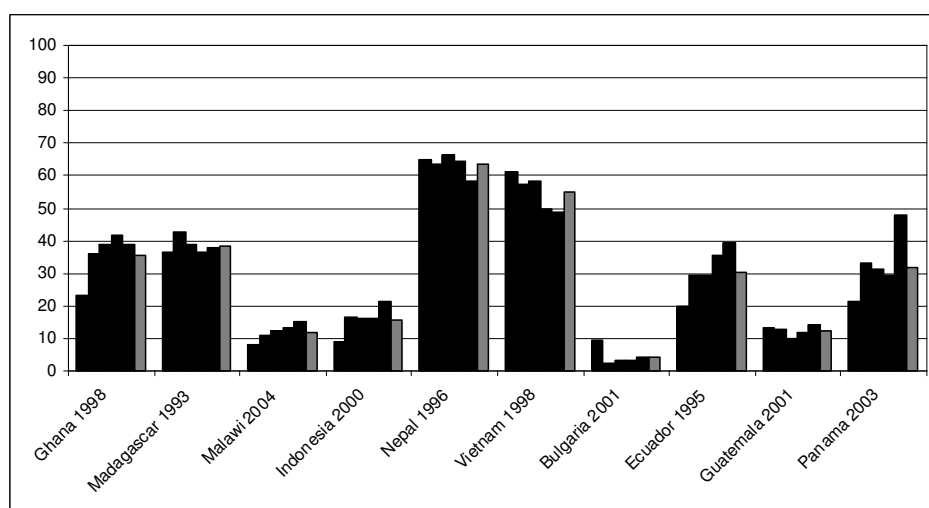
Note: Black represents the six land categories (from left to right landless and the five land quintiles) while grey represents overall access.

VIII. Weaving the threads: How does 'success' in farming relate to access to inputs, assets and services?

In this section we attempt to weave together the threads we have laid so far by investigating the hypothesis that success in farming is in fact constrained by the lack of access to basic assets, inputs and services. The idea is that if farmers are not in a position to exploit the opportunities offered by agricultural markets and remain trapped in a subsistence strategy, it is highly unlikely that for them agriculture will become a workable pathway out of poverty.

To investigate this proposition we look at the extent to which, controlling for a vector of household, individual, and geographical characteristics, access to land, basic agricultural inputs, and credit and technical assistance services are still associated with a lower ability to

participate in the market. We do this by estimating two models that have as dependent variables respectively (a) the share of agricultural production sold, and (b) the log of the value of the agricultural production sold (in local currency). The right-hand side of the models is otherwise identical and so is the estimation procedure.

The theoretical motivation and model for this analysis follows the agricultural output market access literature (Goetz 1992; Key et al., 2000; Bellemare and Barrett., 2006; Boughton et al., 2006). We assume that the decisions of whether to sell and how much to sell are sequential, not simultaneous. Our model is specified as a sample selection model, estimated by using full maximum likelihood.

Our model includes four sets of explanatory variables: a vector of household demographic characteristics, one of household assets (education, labour, land, other non-agricultural physical assets), one of access to agricultural inputs and services (fertilisers, pesticides, irrigation, mechanisation and a principal component index measuring access to public infrastructure), and finally a set of country-specific geographic dummies. Exclusion restrictions variables in our selection equations are, following Boughton et al. (2006), variables that may affect the household reliance on agricultural sales as a source of income, as these might affect farmers perceptions of the risks associated to participating in the agricultural markets. In particular these variables are a migration network dummy (identifying whether the household head has migrated to the current residence), variables on participation in key non-farming activities (non-agricultural self-employment, and agricultural and non-agricultural wage), and a religion dummy (identifying whether the household head belongs to the main religious group in the country).

The models are run separately for each country. A synthesis of the results is presented in what follows[11]. Table 13 reports for the main variables of interest here, the number of positive and negative significant results, with at least 90 percent confidence. In the remaining cases the coefficient on the variable was not significantly different from zero. Two columns are reported for each model, relating to the continuous variable and the selection/participation equation, respectively. These results are preliminary and based on four pairs of country regressions. Future revisions of this paper will present results based on 15 pairs of country regressions.

Table 13. Number of country share and value regressions in which a given independent variable was positive/negative and statistically significant

	Share of agricultural production sold		Log value of agricultural production sold	
	Shares	Selection	Log Value	Selection
Hh Labour	0/1	3/0	3/0	2/0
Land	2/0	4/0	3/0	4/0
Non-ag wealth	2/0	0/2	2/0	0/3
Technical assistance*	1/0	1/0	0/0	1/0
Fertilizers	2/0	3/0	2/1	2/0
Mechanization	4/0	3/0	4/0	2/0
Irrigation	3/0	3/0	1/0	3/0
Pesticides	2/0	3/0	2/0	3/0

* The technical assistance variable is present in only one of the four datasets.

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[11] The full set of results is available from the authors upon request.

As the results presented in this section are preliminary and based on a small sample of countries, only very tentative observations can be made at this stage. Results seem to support the idea that access to basic agricultural inputs and key agricultural assets is crucial in determining farmers' ability to successfully engage in agricultural output markets. Fertilizers, pesticides, mechanization and irrigation use are all positively associated with greater participation in agricultural output markets, and greater share and value of agricultural sales. Assets such as labour and, more consistently, land and are also important in most cases. Non-agricultural wealth is negative correlated to participation in a number of cases, which is not surprising as many richer households may just be engaged in agriculture to produce food for own consumption, while generating their cash income from non-farm sources. Those that do participate in agricultural markets, however, tend to be more successful.

These results are clearly not unexpected, but taken together with the very low level of access to assets, inputs and services documented in the first part of the paper, the results raise serious issues for concern in areas where government policy and other development efforts can have an important role. Anti-poverty strategies, policies and programmes that rely on smallholder agriculture as an engine of growth and a motor of poverty reduction should not ignore this basic message if they are to have a chance at succeeding.

VIII. Conclusions

This paper set out to identify the asset position of rural households, to document access to agrarian institutions and to characterise heterogeneity in access to basic assets and agrarian institutions in a sample of developing and transition countries in four continents. From the results of the analysis a clear picture emerges of a rural space in which small land and livestock holders lack access to key assets, inputs, markets and basic services—the very instruments that are necessary for rural households engaged in farming to achieve an agricultural-led path out of poverty. The overall results also point to a large degree of heterogeneity both within and across countries in terms of access by rural households to essential assets and services.

The results in this paper complement the findings of a study which uses the same dataset to look at sources of rural income. In that study (Davis, et al 2007) one main finding was that poorer rural households lack access to those sources of non-farm income which would enable them to escape poverty. In this paper the focus has been explicitly on assessing the extent to which rural households have access to the means (assets, inputs, services) to engage successfully in agricultural production.

Cross-country analyses of the type carried out in this paper are not well suited for generating detailed policy prescriptions as these require digging deeper into the causal links and into country-specific determinants of the observed patterns. Some key observations of general relevance can however be distilled. The main policy message that emerges from this broad, evidence-based, overview of access to agricultural assets and inputs in the developing world is that much of the agenda the agricultural economics profession and policy makers dealing with agricultural policy issues in developing countries in the last few decades is not outdated and requires renewed emphasis.

While farming continues to be the backbone of much of the rural economy, most farming households in the developing world still have minimal access to basic agrarian services and institutions. Agricultural households in the developing countries covered by the data have limited access to most modern productive inputs and to technical assistance and credit, all key features of a functioning agricultural economy. Most agricultural households lack access to

inputs which require monetary payment, such as pesticides, mechanization and hired labour. Access levels are generally lowest in Africa, and somewhat better in Asia and Africa, but with patterns that vary by type of farmer, country and input – so that far-reaching generalizations are not possible.

Land sizes are extremely small with a large majority of households owning less than one hectare of land, and both land and livestock assets are highly concentrated in a majority of countries. Further, for those households involved in agriculture, alternative forms of access other than ownership (such as rentals or sharecropping) play an important role in most places in facilitating access by poorer households to land. Policies directed at reforming land tenure rights should exercise outmost care at identifying the local specificity of tenure arrangements, as traditional tenure systems, renting in and sharecropping of land are a particularly widespread form of access for the poorer, smaller farmers and the landless.

Given the pervasiveness of agriculture as a livelihood strategy (especially for the poor) in rural areas, it is hard to see how poorer households can get onto an agricultural based path out of poverty when their conditions regarding access to inputs, services and institutions are those described by our data.

A majority of agricultural households do participate in agricultural output markets, with African levels comparable or higher than those of other regions and no clear-cut pattern in the relationship between participation in agricultural sales and expenditure levels. Many households that do participate in markets, though, only sell a small proportion of their output. As we have shown, however, this behaviour varies markedly across countries and is not as directly related as one might have expected to land ownership and overall welfare, prompting the need for a more in-depth analysis of what drives market participation.

We have started digging somewhat into this question, by looking at how market orientation is associated with greater access to agricultural specific inputs and services, after controlling for land ownership and access to non-agricultural wealth. Our results are still preliminary and do not allow making inferences regarding the direction of causality, but they are indeed compatible with the hypothesis that the access to assets, basic agricultural inputs and services does matter for the successful involvement in agricultural output markets.

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Appendix I

Table AI.1. Countries and data sources for analysis

Country	Name of Survey	Year Collected	Number of Observations		
			Total	Rural	Urban
Albania	Living Standards Measurement Study Survey	2005	3,640	1,640	2,000
Bangladesh	Household Income-Expenditure Survey	2000	7,440	5,040	2,400
Bulgaria	Integrated Household Survey	2001	2,633	877	1,756
Ecuador	Estudio de Condiciones de Vida	1995	5,810	2,532	3, 278
Ghana	Ghana Living Standards Survey Round Three	1998	5,998	3,799	2,199
Guatemala	Encuesta de Condiciones de Vida	2000	7,276	3,852	3,424
Indonesia	Family Life Survey- Wave 3	2000	7,216	3,786	3,430
Madagascar	Enquête Permanente Auprès des Ménages	1993-1994	4,505	2,653	1,852
Malawi	Integrated Household Survey-2	2004-2005	11,280	9,840	1,440
Nepal	Living Standards Survey I	1995-1996	3,370	2,655	715
Nicaragua	Encuesta de Medición de Niveles de Vida	2001	4,191	1,839	2,352
Nigeria	Living Standards Survey	2004	3,373	2,657	716
Pakistan	Integrated Household Survey	2001	15,927	9,978	5,949
Panama	Encuesta de Niveles de Vida	2003	6,363	2,945	3,418
Vietnam	Living Standards Survey	1997-1998	6,002	4,272	1,730

Appendix II

Table AII.1. Regional weights, tropical livestock units

Region	Cattle	Buffalo	Sheep	Goats	Pigs	Llamas	Alpaca	Asses	Horses	Mules	Camels	Chickens	Poultry
Near East North Africa	0.70	0.70	0.10	0.10	0.20			0.50	0.40	0.60	0.75	0.01	0.01
North America	1.00	0.00	0.15	0.10	0.25			0.50	0.80	0.60		0.01	0.01
Africa South of Sahara	0.50	0.00	0.10	0.10	0.20			0.30	0.50	0.40	0.70	0.01	0.01
Central America	0.70	0.00	0.10	0.10	0.25			0.50	0.50	0.60		0.01	0.01
South America	0.70	0.70	0.10	0.10	0.25	0.20	0.20	0.50	0.65	0.60		0.01	0.01
South Africa	0.70	0.00	0.10	0.10	0.20			0.50	0.65	0.60		0.01	0.01
OECD	0.90	0.70	0.10	0.10	0.25			0.50	0.65	0.60	0.90	0.01	0.01
East & South East Asia	0.65	0.70	0.10	0.10	0.25			0.50	0.65	0.40	0.80	0.01	0.01
South Asia	0.50	0.50	0.10	0.10	0.20			0.50	0.65	0.40		0.01	0.01
Transition Markets	0.60	0.70	0.10	0.10	0.25			0.50	0.65	0.40		0.01	0.01
Caribbean	0.60	0.60	0.10	0.10	0.20			0.50	0.65	0.40		0.01	0.01
Near East	0.55	0.60	0.10	0.10	0.25			0.50	0.56	0.40	0.70	0.01	0.01
Other	0.60	0.60	0.10	0.10	0.20			0.50	0.65	0.40		0.01	0.01

Source: FAO GLiP