G S S P Background Paper 6

DEFINING SMALLHOLDER AGRICULTURE IN GHANA: WHO ARE SMALLHOLDERS, WHAT DO THEY DO AND HOW ARE THEY LINKED WITH MARKETS?

By Jordan Chamberlin

Ghana Strategy Support Program (GSSP)
Background Paper No. GSSP 0006

August 2007

IFPRI's GSSP Office in Accra

International Food Policy Research Institute
c/o International Water Management Institute (IWMI)
Postal Address:
PMB CT 112, Cantonments, Accra, Ghana
Local Address:
Martin Odei Block, CSIR Campus, Airport Residential Area
Tel: +233-(0)-21-780716 • Fax: +233-(0)-21-784752

http://www.ifpri.org/themes/gssp/gssp.htm

For further information:
Shashi Kolavalli, Senior Research Fellow and
Program Coordinator
(s.kolavalli@cgiar.org; Note: located in Accra)

IFPRI HEADQUARTERS

International Food Policy Research Institute
2033 K Street NW
Washington, DC 20006-1002 USA
Tel. +1-202-862-5600
Fax +1-202-467-4439
E-mail ifpri@cgiar.org

www.ifpri.org

THE GHANA STRATEGY SUPPORT PROGRAM (GSSP)
BACKGROUND PAPERS

ABOUT GSSP

GSSP is a research, communication, and capacity-strengthening program to build the capabilities of researchers, administrators, policymakers, and members of civil society in Ghana to develop and implement agricultural and rural development strategies. With core funding from the U.S. Agency for International Development (USAID)/Ghana and a mandate to develop a multi-donor-funded Program, IFPRI launched GSSP as a partnership between Ghana and its development partners. IFPRI is working with these stakeholders to generate information, improve dialogue, and sharpen decisionmaking processes essential for effective formulation and implementation of development strategies. GSSP informs stakeholders on the role of agriculture and rural development in the broader economic and policy context in line with the emphasis placed on agriculture in Ghana's Growth and Poverty Reduction Strategy. GSSP supports the development and implementation of a system to monitor and evaluate progress toward achieving Ghana's growth and poverty reduction targets and the Millennium Development Goals.

ABOUT THESE BACKGROUND PAPERS

IFPRI's Ghana Strategy Support Program (GSSP) Background Papers contain preliminary material and research results from IFPRI and/or its partners in Ghana. The papers have not been subject to a formal peer review. They are circulated in order to stimulate discussion and critical comment. The opinions are those of the authors and do not necessarily reflect those of their home institutions or supporting organizations.

DEFINING SMALLHOLDER AGRICULTURE IN GHANA: WHO ARE SMALLHOLDERS, WHAT DO THEY DO AND HOW ARE THEY LINKED WITH MARKETS?

By Jordan Chamberlin
Development Strategy and Governance Division

Prepared as part of the Ghana Strategy Support Program and
submitted for consideration as an IFPRI Discussion Paper

August 2007

ABSTRACT

Smallholders in Ghana, as elsewhere, are widely considered to be the largest as well as the most vulnerable component of the rural sector. Ghana professes national development objectives of reducing rural poverty through the increased productivity and commercialization of smallholder agriculture. As a starting point for more detailed discussion of smallholder investment options, this paper explores general questions of definition, i.e. who smallholders are, what and how they produce, and the extent to which they are linked with markets. This work uses household survey data, district-level production data and a variety of mapped infrastructural and biophysical data to characterize the production environments and characteristics of smallholder agriculture. This paper explores the relevance of geographically-differentiated characteristics. Several key issues are highlighted: the less-prevalent use of inputs, lower commercialization, and lower welfare rates of producers with smaller landholdings. Such relationships change in degree, but not in nature, over geographical space. At the same time, it is difficult to impose a "smallholder" definition on a continuum of characteristics that for the most part do not show clear or consistent threshold effects.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

Ghana's current development objectives place a great deal of emphasis on broad-based, pro-poor agricultural growth (GOG 2003). Because of its centrality in the national economy, the rural environment is seen as a particularly important catalyst for wider economic transformation. The national strategy emphasizes improved production of food crops and the expansion of high-value and export-oriented cash crops. Implicit in many of the targeted interventions (e.g. provision of marketing support for farmers, targeting improved transportation infrastructure in crop growing areas) is the transformative goal of increasing the market orientation of the smallholder sector. This goal is rendered much more explicit in many of the rural development initiatives in the country (e.g. Chemonics 2006, DFID 2005) and is quite central in much of the on-going policy dialog.

Smallholder commercialization as a development strategy has important theoretical foundations that often underlie development strategy. An key premise of commercialization as a development strategy is that markets provide increased incomes to households who are able to maximize the returns to land and labor through market opportunities, using earned income for household consumption in ways that are more efficient than subsistence production (Timmer 1997, Pingali 1997). Evidence from elsewhere in sub-Saharan Africa indicates the key role of cash crops in driving processes of agricultural intensification and productivity growth, through the corollary development of interlocked credit, input and output markets (von Braun and Kennedy 1994, Dorward et al. 1998, Shepard 1999). Govereh et al. (1999) show the importance of institutional arrangements in such market development and the consequences of cash crop development for non-cash crop productivity gains.

The basic premise of this paper is rather simple: in order to understand the constraints facing smallholder commercialization as a development strategy, we must better understand the nature of the smallholder sector in Ghana, including current levels of commercialization. Thus, this paper focuses on clearing up prevalent inconsistencies and uncertainty about who Ghanaian smallholders are. This paper attempts to address some key questions:

- How "small" are smallholdings?
- What do smallholders produce?
- How productive are smallholders? Where is growth coming from within the sub-sectors where smallholders predominate?
- To what extent are they engaged with markets?
- To what extent are they poor and/or vulnerable?
- Are there important geographical differences in smallholder production environments and, consequently, in strategic investment options?

This study is preliminary in nature and does not definitively answer all the questions above. The descriptive work presented here, however, should provide a useful entry point for further discussion of interventions targeted toward Ghana's rural smallholders.

The orientation and structure of this paper is as follows. The first section reviews definitions of smallholders which have been employed in Ghana and elsewhere, reflecting on key themes figuring across definitions, and information available for such characterization in Ghana. The following section draws on agricultural household data to limn the major dimensions of a characterization which is responsive to the motivating questions listed above. Section 4 examines trends in the agricultural sub-sectors in which smallholders dominate, thus linking smallholders with recent broader patterns in Ghanaian agriculture. Section 5 considers current levels of physical accessibility to markets that smallholders have in different parts of the country, and the role that such access appears to play in commercialization and other behaviors. The paper concludes with some implications of this analysis for strategies promoting increased commercialization and productivity.

2. DEFINING GHANAIAN SMALLHOLDERS

2.1 Alternative definitions: key themes

Built into the epithet "smallholder" is the connotation of limited land availability. Other connotations may sketch a broader view of "resource-poor" farmers: e.g. those with limited capital (including animals), fragmented holdings, limited access to inputs. Noting that resource-poor livestock keepers are a very diverse group, Chipeta et al (2003) note that number of animals may be a misleading definition. Ghana's Poverty and Social Impact Analysis (PSIA: Asuming-Brempong et al. 2004) implicitly makes a similar argument for Ghanaian farmers, arguing that different resource and risk conditions better define smallholders than simple measures of landholdings. Others have similarly noted that two farmers with the same farm size, but one producing a high-value crop for market while the other produces a staple for home consumption, cannot be meaningfully compared (e.g. von Braun 2005). More nuanced conceptualizations of smallholders, however, tend to be more difficult to measure. While quantitatively precise definitions are elusive, in looking across a variety of working definitions – for Ghana and elsewhere – there figure several key themes. Among these are: holding size, wealth, market orientation and levels of vulnerability to risk.

As suggested above, holding size is perhaps the most direct and easily introduced indicator of who smallholders are. It may also be the most abused. Ekboir, Boa, Dankyi (2002) stated that "a small-scale farmer in any region of Ghana has less than 5 [hectares]" but do not offer any support for this definition, nor insights into how prevalent such a definition renders smallholders within Ghanaian agriculture. The Ministry of Agriculture (MOFA 2006) maintains that "Agriculture is predominantly on a smallholder basis in Ghana. About 90% of farm holdings are less than 2 hectares in size," although sources for these numbers are also un-cited.

While not seeking a definition of smallholders per se, Jayne et al. (2003) do provide evidence in East and Southern Africa that the holding size of smallholders is strongly linked with household income, especially for very small farm sizes (< 1 hectare). Highlighting the fact that intra-village variation in land access is often higher than inter-village variation, they reinforce the fact that it is misleading to speak of smallholder zones and to target on that basis. Thus, while the linkage between holdings and poverty appears to be strong at the household level, the value of average holding size as a meaningful indicator of geographical patterns of poverty is uncertain.

Using wealth rankings (although with somewhat ambiguous methods), the PSIA defines five categories of Ghanaian smallholders: *Large Scale Commercial Farmers*, *Small Commercial Farmers*, *Semi-Commercial Farmers*, *Non-Poor Complex Diverse Risk Prone Farmers*, and *Poor Complex Diverse Risk Prone Farmers*. The latter three categories are

together said to constitute smallholder farmers. The report generates some indicators of prevalence of smallholders on the basis of "the assumption that [non-commercial smallholders] constitute about 95% of the agricultural population" although this assumption is undefended.

As intimated in the definition above, the "smallholder" label is often an implied cognate for subsistence farmers. In other words, a largely low market orientation is part of the working definition of smallholders that is adopted in policy discussions. This embeddedness is reflected in the general emphasis of PRSP[1]s on transforming smallholder agriculture from subsistence to market orientation. In many cases this idea is very explicit. As the focus of Ghana's PSIA (Asuming-Brempong et al. 2004), for example, reference is consistently made to Ghana's "smallholders/subsistence farmers".

Different levels of vulnerability to risk, like wealth, require more nuanced conceptualization than holding size and market orientation and, partly because of this, may be more difficult to provide quantitatively explicit indicators of. Nonetheless, an important assumption of smallholder-focused development is that relatively high degrees of vulnerability characterize smallholder farmers. Risk – the degree of probability of loss of welfare – may be of various types[2] but across such variation, vulnerability is linked both exposure as well as coping ability (Chambers 1989), which in turn are associated with levels of assets (Moser 1998). That smallholder assets are generally limited is an important filter, then, for understanding risk and vulnerability.

Other important defining characteristics include conceptualizing smallholders as resource poor farmers (i.e. including such considerations as land quality and access to technologies such as irrigation) and farm enterprises primarily dependent upon family labor.[3]

Understanding the role of these different traits in providing a meaningful working definition of smallholders invokes the following question: how much of each of these aspects is captured by the others? The PSIA suggests that these characteristics are at least somewhat related, farmers with lower levels of market orientation and higher levels of risk tending to

[1] Poverty Reduction Strategy Papers (PRSPs) may carry different names in different countries, but generally refer to national strategies for achieving pro-poor economic growth and which often emphasize rural and agricultural development efforts that focus on the poor, smallholder majorities of agricultural populations.

[2] The PSIA identifies eight major types of risk faced by smallholders: 1. production risks; 2. credit risks; 3. income risks; 4. labor & health risks; 5. nutritional risks; 6. price risks; 7. vulnerability to unethical trading practices; 8. employment risks (Asuming-Brempong et al. 2004).

[3] The literature suggests that dependence on family labor would seem to be a less useful criterion for defining smallholders in Ghana than elsewhere. Duncan and Howell (1992) make the following remarks: "The hiring of labour is widespread, even among low-income households and especially on a seasonal basis. In Ghana, where the major constraint on agricultural production was found to be scarcity of labour, the most recent data [from 1970] suggest that about 60% of rural households use some outside labour, although most cultivation uses family labour. Even among the smallest producers (below 0.8 ha), over one-half used hired labour, and of those described as subsistence producers, one-quarter used hired labour".

have smaller amounts of land available to them. With these different issues in mind, this analysis drew on currently available household data for Ghana.

2.2 Data available for characterizing smallholders and smallholder agriculture

This analysis relies on two main sources of statistical data. Household level information is taken from the Ghana Living Standards Survey of 2005/6 (GLSS5)[4]. This is a nationally representative sample of 8687 households, able to generate inferences at the regional and major agroecological levels. The GLSS was designed to provide information on household consumption and expenditure, but contains a great deal of information on the specific production and marketing activities of the rural agricultural households surveyed.

In order to consider trends in production over time and space, this analysis uses district-level production data on major crops, compiled by the Statistics, Research and Information Directorate of the Ministry of Food and Agriculture (MoFA-SRID). District-level data have been compiled for the period 1992-2006.

[4] As well as the Ghana Living Standards Survey of 1998/99 (GLSS4), which is presented alongside GLSS5 data in the Appendix.

3. CHARACTERISTICS OF GHANAIAN SMALLHOLDERS

In Ghana, the various definitions of smallholders are accompanied by differing estimates of such things as their contribution to the agricultural economy and incidence of poverty among them. Nyanteng and Seini (2000) state that over 90% of the country's food production derives from holdings of 3 ha or less. Owusu-Baah (1995) reports an estimated average farm size of 3.9 ha and noted that more than 50% of households own less than 3 ha. This is the only instance in the literature on Ghana that empirical estimation of landholding has been made, although the survey sample size was very limited (69 households) and was confined to the Mamprusi area of northern Ghana.

An IFAD project report (IFAD 2006) for the Upper East region estimated that in 1986 two-thirds of those farming less than 4 acres (1.6 ha), were living in poverty. Baden et al (1994), in discussing agricultural labor use for the rural sector in general, stated that even among smallholders farming less than 1.6 ha, about half hired some form of labor, underscoring the fact that resource-constrained farmers are still labor users.

Against this backdrop of clues about the nature of Ghanaian smallholder agriculture, this section attempts to characterize Ghanaian smallholders on the basis of available data on landholding size, crop mix and commercialization levels, using the 1998-9 Ghana Living Standard Survey (GLSS4) as the primary source of data.

3.1 Landholding

From an analysis of household data using a sample of 8687 households from the GLSS5, there are differences in the distribution of landholding size at the ecological zone as well as by region[5]. The savanna zone (with a mean landholding of 4.0 ha) has larger holdings compared to the coastal and forest zones (with 2.3 and 3.1 ha respectively)[6]. There is also a significant difference between smallholder landholdings and large land holdings. In terms of the distribution of landholding, over 70% of farmers own the average landholding or less whether at the national level or the ecological level. Table 1 below gives the distribution of land holding in Ghana by ecological zone. The majority of agricultural households in the forest and coastal zones operate 2 or less hectares (52% and 67%), which the proportion of savanna households with 2 or less hectares is nearly 45%.

[5] Landholding in this paper refers to land used by farmers for production. It is the sum of all reported plot sizes per household. It does not distinguish between types of tenure arrangements, although such information is included in the GLSS4 and could be used to in subsequent analysis. The importance of distinguishing modalities of access to land has been well argued (e.g. de Janvry and Sadoulet 2005, Deininger 2003) and is not lost on the author. Subsequent analysis should look more closely at tenure and other characteristics of land access.

[6] On the advice of GSS and consultants to the GLSS5, plot sizes larger than 250 hectares were dropped as they were felt to be unreliable. Thus, the true mean holding sizes may be very slightly larger than the values reported here.

Table 1: Distribution of landholding sizes, 2005/06

	share of smallholders by holding category							avg. holding
Ecological zone	< 0.5 ha	0.5-1 ha	1-2 ha	2-3 ha	3-4 ha	4-5 ha	> 5 ha	***size (ha)***
Coast	26%	18%	23%	14%	4%	4%	10%	*2.3*
Forest	16%	15%	21%	16%	8%	8%	16%	*3.1*
Savanna	10%	12%	22%	18%	8%	9%	20%	*4.0*
Region								
Western	15%	15%	23%	18%	8%	8%	13%	*3.6*
Central	10%	17%	22%	17%	9%	8%	18%	*3.5*
Greater Accra	17%	14%	21%	15%	7%	7%	19%	*1.6*
Eastern	27%	18%	21%	14%	5%	5%	10%	*2.1*
Volta	23%	22%	28%	14%	4%	5%	5%	*2.2*
Ashanti	3%	6%	16%	23%	10%	14%	30%	*2.7*
Brong Ahafo	9%	20%	34%	12%	4%	5%	17%	*3.5*
Northern	7%	11%	29%	26%	10%	8%	10%	*5.6*
Upper East	31%	19%	19%	11%	7%	5%	9%	*3.6*
Upper West	15%	10%	18%	18%	8%	10%	21%	*2.7*
National	*16%*	*15%*	*22%*	*17%*	*7%*	*8%*	*16%*	*3.2*

Figure 1: Histogram of landholding size distribution by major ecological zone

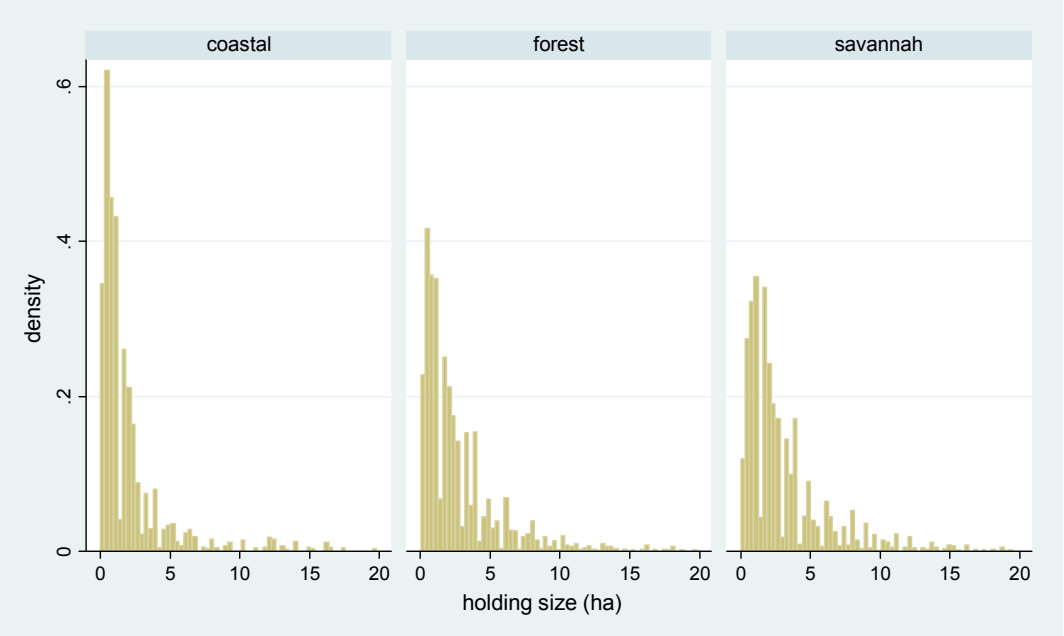
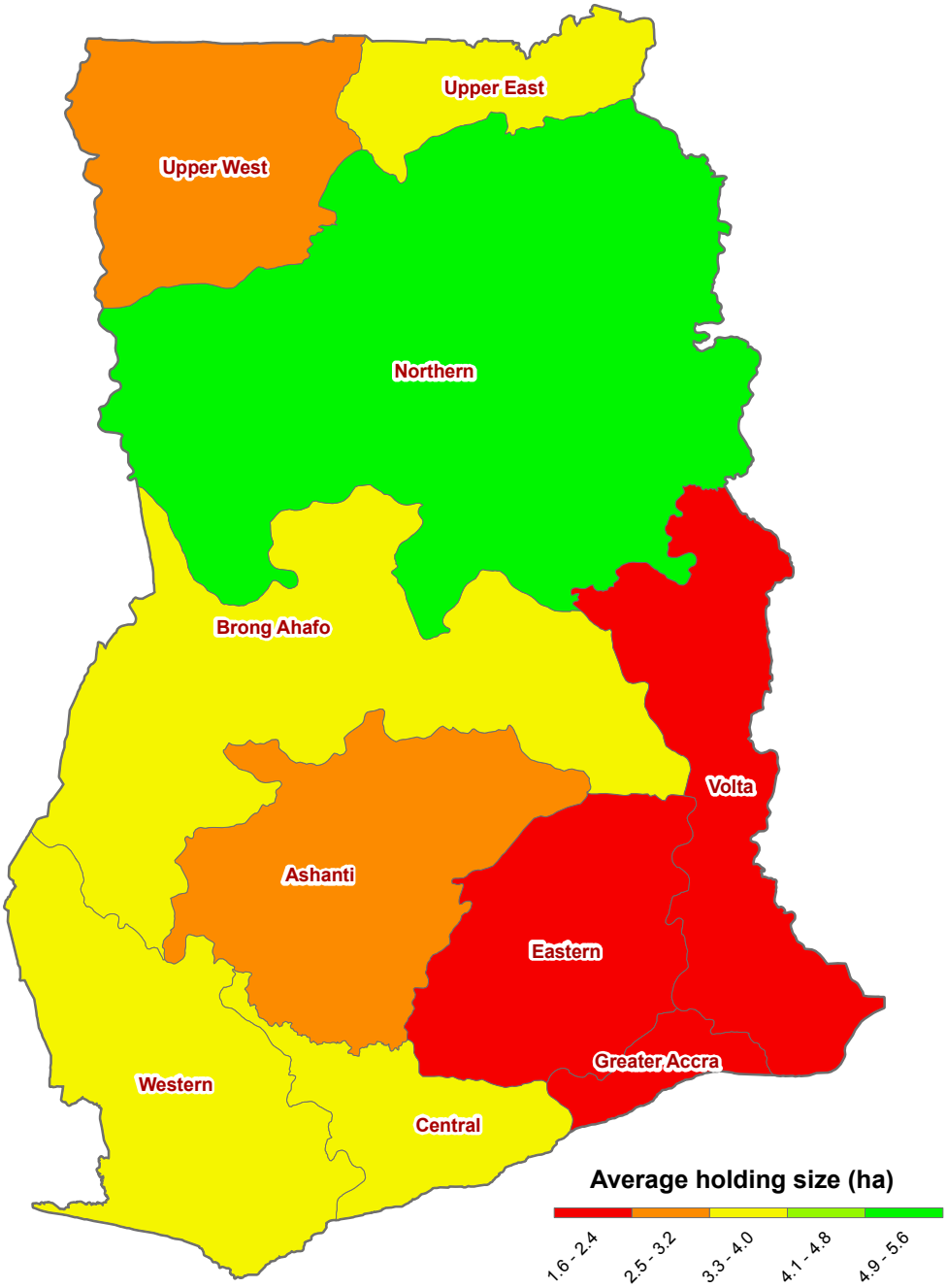


Figure 2: Regional average holding sizes, 2005/06



Average landholding sizes in the GLSS5 sample is 3.2 hectares (a slight increase from the 2.8 hectare average in 1998/99). Because this distribution is skewed to the smaller end of the range (see Figure 1 above) the average may not be a bad shorthand definitional criterion to apply, since it captures the majority of smallholder situations in every region.

However, in order to facilitate a more open-ended analysis, this paper considers a range of landholding classes (as shown in Table 1).

By geographic region, holding sizes vary considerably (Table 1 and Figure 2). The Northern region has the largest average holding sizes, followed by the Upper East and forest and transitional zones. Average holding sizes are smallest in the densely populated southeastern regions. In general, smallest average holding sizes are found in the coastal areas, where almost a quarter of all holdings are less than half a hectare. In the northern savanna regions, there is considerable variety in holding size distributions, especially in the large and relatively heterogeneous Northern region.

About half of all households have less than 2 hectares and more than three-quarters have 3 hectares or less, reinforcing the idea that the majority of rural agricultural households are in fact operating with quite small land holdings. From a rural development perspective, these holding distributions may be particularly problematic in the north, where land productivity is lower in general and off-farm income opportunities are more restricted. That said, the average size of smallholdings in the north has grown more over the last decade than elsewhere (see Appendix A for comparison of summary statistics from 1998/99 and 2005/06). This may indicate that holdings too small to be viable have simply dropped out of production in the north.

For another perspective on the geographical distribution of smallholdings, Table 2 shows an index of relative shares of smallholdings, in which values greater than one indicate relatively high concentrations of smallholdings. The very smallest holding sizes are found in highest relative proportions in the Upper East as well as some parts of the coastal south, particularly in Eastern and Volta regions. When the smallholding threshold is extended to 3, 4 or 5 hectares, other regions have slightly overrepresented smallholder populations, although Eastern, Volta and Upper East continue to be the regions where the largest relative concentrations of smallholders are found.

Table 2: Regional share of smallholders relative to share of all holders (cumulative), 2005/06

	< 0.5 ha	< 1 ha	< 2 ha	< 3 ha	< 4 ha	< 5 ha
Western	0.95	0.99	**1.03**	**1.04**	**1.04**	**1.04**
Central	0.62	0.87	0.93	0.95	0.97	0.98
Greater Accra	**1.05**	**1.01**	**1.00**	0.98	0.98	0.97
Eastern	**1.66**	**1.47**	**1.27**	**1.16**	**1.12**	**1.08**
Volta	**1.41**	**1.47**	**1.39**	**1.26**	**1.19**	**1.14**
Ashanti	0.16	0.27	0.46	0.68	0.74	0.84
Brong Ahafo	0.59	0.95	**1.21**	**1.09**	**1.03**	1.00
Northern	0.47	0.61	0.91	**1.06**	**1.09**	**1.08**
Upper East	**1.91**	**1.61**	**1.31**	**1.15**	**1.13**	**1.08**
Upper West	0.93	0.82	0.82	0.89	0.91	0.95

Note: Value shown = (share of holders in class)/(share of all holders). Highlighted values indicate areas where there the share of all smallholders is greater than the share of all farming households.

3.2 Recent trends landholding patterns

Research elsewhere has noted that the available evidence indicates that throughout the developing world the number of small farms is increasing, particularly in Asia and sub-Saharan Africa where farm sizes are already very small (von Braun 2005, Nagayets 2006). This suggests that population growth in these areas is being largely absorbed by an agricultural sector of increasingly fragmented holdings.

This may or may not be the case in Ghana, especially considering the very strong rural-urban migration patterns (Yilma et al 2007). There is some evidence of that the patterns of land holdings have remained relatively stable over the last decade. The table below compares data from 1998-1998 and initial data from 2005-2006 (Kolavalli and Jimah, forthcoming). For both years, average and median regional and national holding sizes are presented for two groups: all farming households, and only those with holdings of less than 1 hectare.

Overall patterns are relatively consistent over both periods. Mean values are much more volatile than median values, possibly indicating sensitivity to changes at the larger end of the holdings spectrum in the survey sample. For the agricultural households with less than 1 hectare of land, patterns are much more stable over time as well as space.

Appendix A offers more detailed views of changes over the last decade, pairing tabular summaries from 1998/99 and 2005/06.

Table 3. Changing patterns of landholdings in Ghana.

	all households		hh w/ <= 1ha	
2005-2006	**mean**	**median**	**mean**	**median**
Western	4.33	2.02	0.53	0.40
Central	6.52	1.62	0.53	0.40
Greater Accra	1.38	0.81	0.49	0.40
Eastern	7.08	1.21	0.49	0.40
Volta	2.31	1.01	0.49	0.40
Ashanti	2.75	1.62	0.53	0.53
Brong Ahafo	3.68	1.82	0.61	0.69
Northern	9.19	3.24	0.65	0.81
Upper East	5.22	1.21	0.61	0.81
Upper West	2.75	2.02	0.65	0.81
national	*4.82*	*1.62*	*0.53*	*0.53*

	all households		hh w/ <= 1ha	
1998-1999	**mean**	**median**	**mean**	**median**
Western	3.69	2.02	0.52	0.40
Central	3.04	1.82	0.56	0.61
Greater Accra	1.24	1.21	0.56	0.61
Eastern	2.43	0.77	0.46	0.40
Volta	2.59	1.21	0.41	0.40
Ashanti	3.35	2.02	0.54	0.52
Brong Ahafo	4.33	2.43	0.60	0.61
Northern	2.68	2.43	0.55	0.45
Upper East	2.24	2.02	0.72	0.81
Upper West	2.08	1.82	0.65	0.77
national	*2.94*	*1.62*	*0.50*	*0.40*

	all households		hh w/ <= 1ha	
difference	**mean**	**median**	**mean**	**median**
Western	17%	0%	2%	0%
Central	114%	-11%	-6%	-33%
Greater Accra	11%	-33%	-13%	-33%
Eastern	191%	58%	6%	0%
Volta	-11%	-17%	18%	0%
Ashanti	-18%	-20%	-2%	1%
Brong Ahafo	-15%	-25%	1%	13%
Northern	242%	33%	18%	80%
Upper East	133%	-40%	-15%	0%
Upper West	32%	11%	-1%	5%
national	*64%*	*0%*	*6%*	*30%*
avg regional difference	70%	-4%	1%	3%

Source: GLSS4 & GLSS5.
Difference = total percentage change from 1998/1999 to 2005/2006.

3.3 Crop mix

In general, producers with smaller holdings have portfolios with fewer number of crops compared to producers with larger holdings. This is true across geographical perspectives, i.e. at national, regional and ecological zone levels.

The national average number of crops[7] in rural farm portfolios is just less than 4. Although there is some variation across geographical space, in all ecological zones the trends of increased number of crops with holding size is statistically significant[8]. Fewer crops in the portfolios of producers with smaller farms may imply that they are more vulnerable to the risk of crop failure. In other words, smallholders are not as diversified as large holders. The table below gives a comparison of mean number of crops per household for small and large holders by ecological zone.

Table 4: Mean number of crops per household by holding size and ecological zone, 2005/06

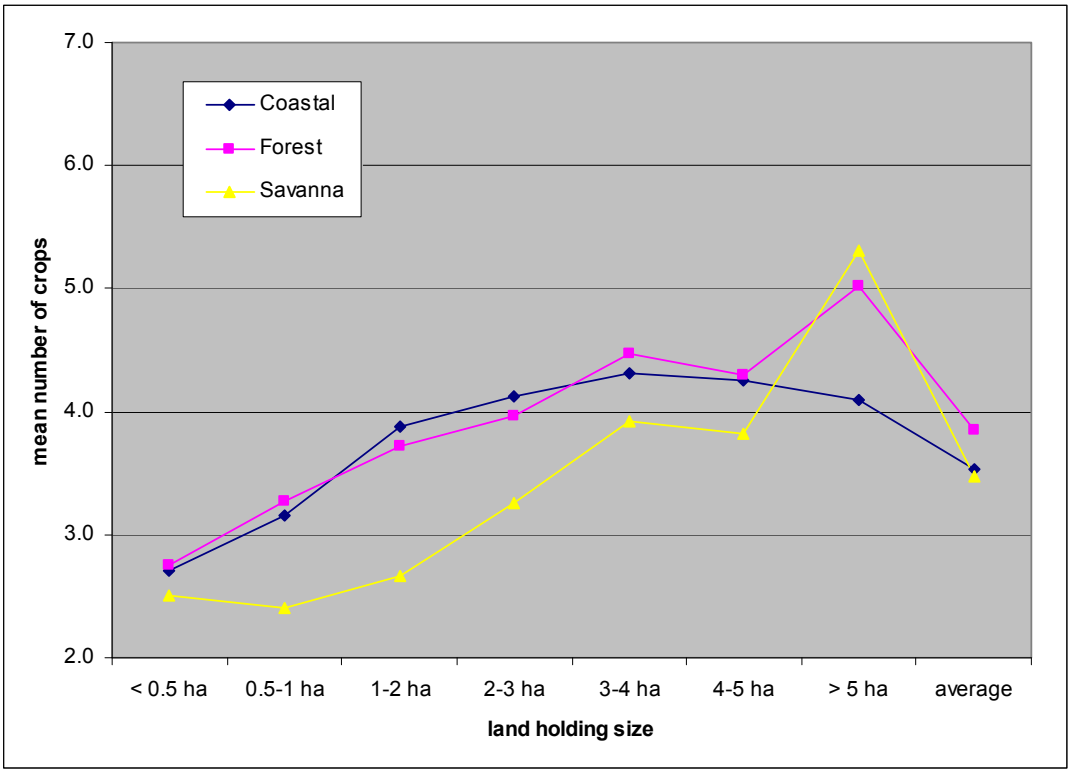
holding size	Coastal	Forest	Savanna	*average*
< 0.5 ha	2.7	2.8	2.5	*2.7*
0.5-1 ha	3.2	3.3	2.4	*3.0*
1-2 ha	3.9	3.7	2.7	*3.4*
2-3 ha	4.1	4.0	3.3	*3.7*
3-4 ha	4.3	4.5	3.9	*4.3*
4-5 ha	4.3	4.3	3.8	*4.1*
> 5 ha	4.1	5.0	5.3	*5.0*
average	*3.5*	*3.8*	*3.5*	*3.7*

Although the general outline of these patterns appears to have been fairly consistent over the previous decade, there has been a notable decrease in the average diversity of smallholder portfolios in the Savanna zone (see Tables 4a and 4b in the Appendix). This may indicate a trend toward increased specialization, but it may also indicate a breakdown in crop alternatives (e.g. through diminished crop-specific input and/or output markets). The numbers for other regions have remained fairly consistent, however.

[7] Because of the way this information was collected by the GLSS, there is likely some underestimation of crop presence. The questionnaire asks the holder to identify, for each plot, up to two crops per season (where each year has 2 seasons).

[8] This relationship is significant at the p=.01 level in all regions and ecological zones, although holding size by itself explains a relatively small amount of the variation in crop mix. The lowest amount of variation is explained in the coastal areas, where better access to inputs and horticulture markets may explain a higher degree of crop mix independence from holding size.

Figure 3: Mean number of crops per household by holding size and ecological zone



Maize and cassava are the most frequent crops in the portfolios of households[9]. Although the presence of these crops in farm portfolios is relatively constant across holding sizes (and major geographical zones), the importance of these crops is negatively related to holding size. Of the nearly 12% of households who grew *only* maize and/or cassava, the mean household landholding size is 1.7 hectares (and the median is 0.8 hectares)[10]. Although data quality issues precluded the calculation of crop-specific harvest area shares, an index was defined to measure the importance of a particular crop within a producer portfolio. This index is based on the presence of crop in a household portfolio (where 1 indicates presence; 0 absence) divided by the number of crops reported. Aggregating this index indicates the importance of cassava and maize in particular in the portfolios of producers with smaller holding sizes (Table 5), highlighting the importance of these commodities for smallholder incomes and food security.

[9] The GLSS5 includes codes for 43 crops. However, in order to maintain comparability with data from the GLSS4, only the 34 crop designations that appear in both surveys were considered: cocoa, coffee, rubber, coconut, oil palm, plantain, banana, oranges, wood, cola nut, kenef, cotton, groundnut/peanut, tobacco, pineapple, sugar cane, cassava, yam, potatoes, maize, rice, guinea corn/sorghum/millet ropes, tomatoes, okro, garden egg/egg plant, beans/peas, pepper, leafy vegetables, onion, avocado pear, mango and pawpaw, as well as catch all designations for other vegetables and other crops.

[10] This is a less severe, but otherwise consistent, story with that from 1998/99: 22% of households in the GLSS4 sample had only maize and/or cassava in their portfolio; the average holding size for these households was 1.2 hectares.

Table 5: Average index of crop importance in portfolio, 2005/06

holding size	cassava	maize	plantain	yam/ cocoyam	groundnut	sorghum/ millet	rice
< 0.5 ha	**0.29**	**0.24**	0.12	0.03	0.04	0.03	0.01
0.5-1 ha	**0.21**	**0.23**	0.10	0.06	0.06	0.08	0.03
1-2 ha	**0.17**	**0.20**	0.09	0.06	0.08	0.10	0.04
2-3 ha	0.16	**0.21**	0.09	0.07	0.07	0.07	0.03
3-4 ha	0.16	0.19	0.09	0.08	0.07	0.05	0.03
4-5 ha	0.14	0.20	0.10	0.07	0.07	0.06	0.03
> 5 ha	0.13	0.18	0.09	0.07	0.06	0.05	0.03
average	***0.18***	***0.21***	*0.10*	*0.06*	*0.07*	*0.07*	*0.03*

Note: Index = presence of crop / number of crops produced; where a value of 1 would indicate that it is the only crop produced.

Table 6: Share of producer households with maize and cassava in their portfolios, by holding size and ecological zone, 2005/06

	maize			**cassava**		
holding size	coast	forest	savanna	coast	forest	savanna
< 0.5 ha	66%	63%	41%	85%	83%	37%
0.5-1 ha	70%	68%	44%	89%	80%	22%
1-2 ha	74%	68%	47%	92%	82%	22%
2-3 ha	76%	66%	64%	90%	82%	24%
3-4 ha	68%	66%	72%	87%	86%	35%
4-5 ha	65%	65%	78%	91%	81%	25%
> 5 ha	63%	67%	86%	85%	81%	35%
average	*70%*	*66%*	*61%*	*88%*	*82%*	*27%*

Looking at the share of farmers producing different crops, we observe some interesting patterns in terms of holding size as well as geographical zone. Maize and cassava are grown by most producers, largely cutting across differences in land holding and geography. While most high-value cash crops (e.g. tomatoes, oil palm, cocoa) are more prevalent, on average, among larger landholders, this is not uniformly so: there are much flatter patterns in the coastal areas, perhaps suggesting that greater access to input and output markets in the south may provide more incentives for high-value production. These relationships should be investigated more thoroughly with the GLSS5 data.

Table 7: Proportion of households growing various crops by ecological zone

Coast	holding size							zone
	< 0.5 ha	0.5-1 ha	1-2 ha	2-3 ha	3-4 ha	4-5 ha	> 5 ha	*average*
maize	**66%**	**70%**	**76%**	**76%**	**68%**	**65%**	**63%**	***70%***
sorghum/millet	0%	0%	0%	0%	3%	0%	0%	*0%*
rice	0%	0%	1%	1%	0%	0%	0%	*1%*
cassava	**85%**	**89%**	**90%**	**90%**	**87%**	**91%**	**85%**	***88%***
yam/cocoyam	2%	6%	12%	12%	13%	0%	8%	*7%*
plantain	22%	30%	35%	35%	45%	44%	49%	*34%*
groundnuts	1%	1%	3%	3%	6%	3%	4%	*2%*
beans	3%	2%	3%	3%	3%	0%	6%	*3%*
tomatoes	12%	15%	23%	23%	32%	15%	21%	*18%*
okro	3%	4%	11%	11%	10%	12%	10%	*6%*
peppers	25%	24%	35%	35%	39%	35%	28%	*29%*
oil palm	18%	17%	37%	37%	32%	53%	30%	*26%*
cocoa	2%	9%	22%	22%	32%	29%	31%	*15%*

Forest	holding size							zone
	< 0.5 ha	0.5-1 ha	1-2 ha	2-3 ha	3-4 ha	4-5 ha	> 5 ha	*average*
maize	**63%**	**68%**	**66%**	**66%**	**66%**	**65%**	**67%**	***66%***
sorghum/millet	0%	0%	0%	0%	0%	0%	0%	*0%*
rice	0%	1%	3%	3%	2%	1%	4%	*2%*
cassava	**83%**	**80%**	**82%**	**82%**	**86%**	**81%**	**81%**	***82%***
yam/cocoyam	11%	16%	23%	23%	26%	19%	27%	*20%*
plantain	**53%**	**59%**	**66%**	**66%**	**71%**	**76%**	**79%**	***66%***
groundnuts	4%	3%	2%	2%	5%	3%	4%	*3%*
beans	1%	3%	4%	4%	6%	2%	5%	*3%*
tomatoes	7%	7%	14%	14%	13%	15%	14%	*11%*
okro	4%	6%	6%	6%	7%	3%	10%	*7%*
peppers	8%	15%	18%	18%	21%	18%	23%	*17%*
oil palm	15%	18%	29%	29%	40%	42%	47%	*29%*
cocoa	**13%**	**22%**	**52%**	**52%**	**61%**	**68%**	**76%**	***44%***

Savanna	holding size							zone
	< 0.5 ha	0.5-1 ha	1-2 ha	2-3 ha	3-4 ha	4-5 ha	> 5 ha	*average*
maize	**41%**	**44%**	**64%**	**64%**	**72%**	**78%**	**86%**	***61%***
sorghum/millet	**19%**	**36%**	**40%**	**40%**	**41%**	**45%**	**52%**	***40%***
rice	12%	18%	20%	20%	22%	21%	31%	*21%*
cassava	37%	22%	24%	24%	35%	25%	35%	*27%*
yam/cocoyam	17%	26%	38%	38%	48%	44%	54%	*35%*
plantain	6%	2%	4%	4%	3%	6%	5%	*4%*
groundnuts	**25%**	**32%**	**43%**	**43%**	**49%**	**48%**	**58%**	***43%***
beans	14%	16%	25%	25%	28%	26%	49%	*27%*
tomatoes	9%	4%	7%	7%	7%	10%	23%	*9%*
okro	10%	5%	12%	12%	14%	17%	38%	*14%*
peppers	14%	6%	14%	14%	14%	16%	35%	*15%*
oil palm	1%	0%	0%	0%	2%	2%	2%	*1%*
cocoa	0%	0%	3%	3%	2%	4%	4%	*2%*

Note: Bolded numbers correspond to crops grown by 40% or more households in that ecological zone

Synthesizing from the preceding tables, it appears that producers with smaller landholdings tend to have less diverse crop portfolios and consequently a greater reliance on a narrower set of production strategies. This may imply more vulnerability to risks associated

with crop and/or market failure. The lower prevalence of cash crops in smallholder portfolios suggests that limited land resources may be preferentially allocated for production oriented toward food security. This pattern appears to be more pronounced in the forest and savanna zones than in the coastal south.

3.4 Commercialization

This analysis examined the current rate of commercialization of five crops (maize, rice, groundnut, beans and sorghum/millet). Commercialization rates vary according to type of crop and ecological zone. At the national level groundnut has the highest rate of 69% while sorghum/millet has the lowest rate of 25%. Market participation for households with smaller holdings, while generally less than that of larger holders, is significant even at the smallest holding sizes, and for all commodities evaluated (Table 8 and Figure 3).

Table 8: Market participation* for selected crop producers

holding size	maize	rice	groundnuts	beans	sorghum	millet
< 0.5 ha	53%	26%	50%	62%	62%	15%
0.5-1 ha	55%	39%	59%	33%	33%	12%
1-2 ha	56%	43%	56%	30%	30%	11%
2-3 ha	58%	52%	78%	55%	55%	34%
3-4 ha	58%	65%	78%	67%	67%	29%
4-5 ha	63%	62%	81%	61%	61%	40%
> 5 ha	59%	76%	85%	69%	69%	46%
all	*57%*	*54%*	*72%*	*54%*	*54%*	*27%*

* the share of producing households who market some proportion of their production

The share of production which is sold (by those who sell) is fairly consistently associated with holding size across commodities and geographical zones. Figure 4 illustrates this basic pattern at the national level. Households with the smallest holdings tend to market more of their production than do households with moderately small holdings (1~4 hectares). At relatively larger holding sizes, the marketed share of production increases. This may indicate rather inelastic cash income needs, which moderate holdings are able to satisfy with lower marketed shares of total production (perhaps devoting the rest to household food security). For households with larger holdings, commercially-oriented specialization may be easier to accommodate.

Figure 4: Share of producers who sell, 2005/06

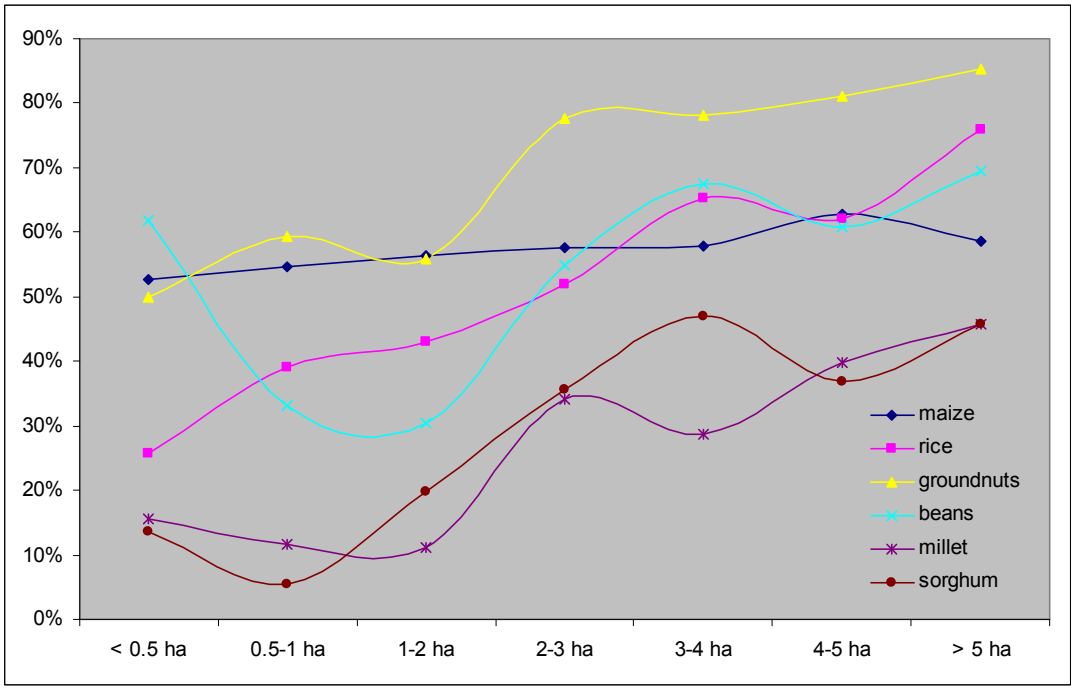
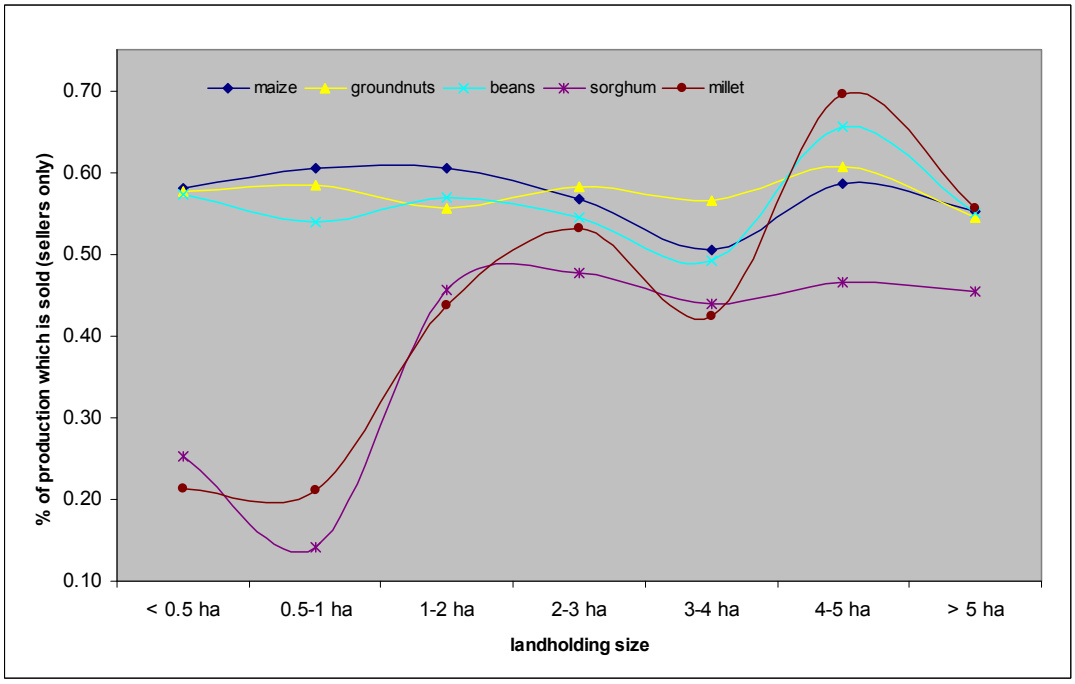


Figure 5: Share of production which is sold (by producers who sell), 2005/06



Market participation rates do vary somewhat geographically. The savanna zone has the lowest rates of commercialization in general (with the exception of rice), probably reflecting the greater remoteness of the north and consequently fewer market opportunities.

Table 9: Market participation* for selected crop producers, by ecological zone

	maize			rice		
holdings	coast	forest	savanna	coast	forest	savanna
< 0.5 ha	57%	53%	42%			29%
0.5-1 ha	65%	60%	31%		100%	36%
1-2 ha	69%	64%	38%	100%	100%	40%
2-3 ha	68%	62%	48%	100%	78%	50%
3-4 ha	62%	58%	57%		100%	62%
4-5 ha	72%	70%	53%		45%	63%
> 5 ha	57%	56%	61%		100%	73%

	groundnuts			beans		
holdings	coast	forest	savanna	coast	forest	savanna
< 0.5 ha		63%	50%	100%	40%	56%
0.5-1 ha	100%	89%	55%	48%	50%	31%
1-2 ha		76%	54%	53%	62%	28%
2-3 ha	79%	85%	77%	100%	63%	53%
3-4 ha	100%	86%	77%		73%	68%
4-5 ha		100%	81%			61%
> 5 ha	100%	100%	84%	61%		68%

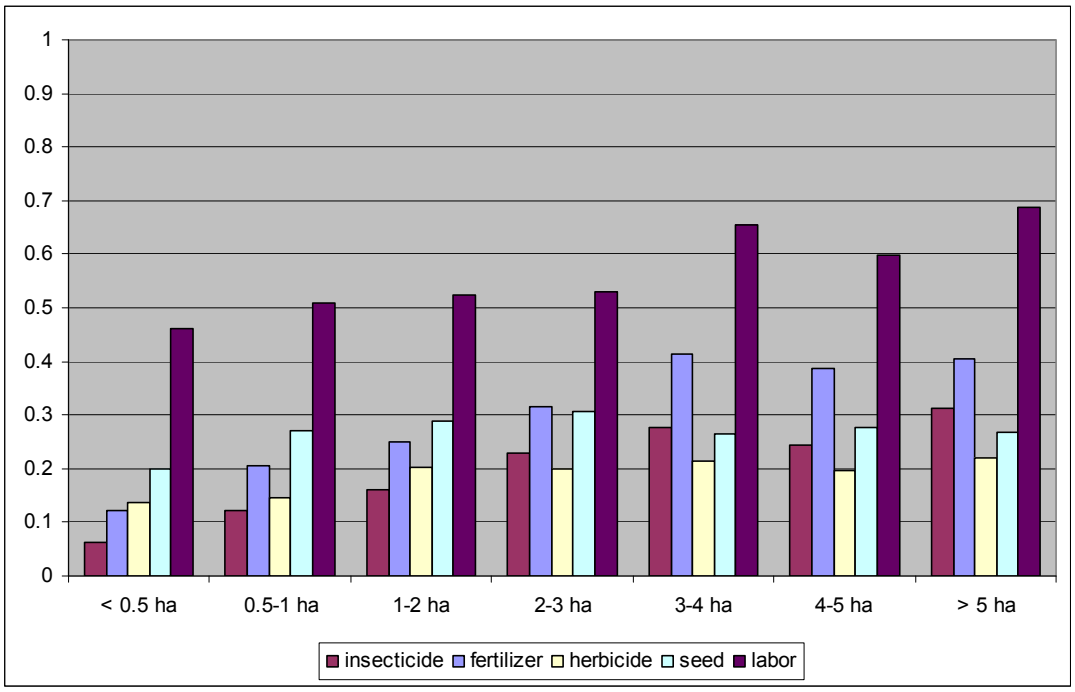
	sorghum			millet		
holdings	coast	forest	savanna	coast	forest	savanna
< 0.5 ha			14%			15%
0.5-1 ha			5%			12%
1-2 ha			20%		100%	10%
2-3 ha			36%			34%
3-4 ha	100%		46%			29%
4-5 ha			37%			40%
> 5 ha			46%			46%

* the share of producing households who market some proportion of their production

3.5 Input use

Because of weaknesses in the harvest area data from GLSS5, a direct assessment of smallholder yields at the household level was not possible. However, this paper does consider input use across geography and landholding dimensions. (District level yield trends in commodities important to smallholders are examined in the next section.)

Figure 6: Share of holders using purchased inputs

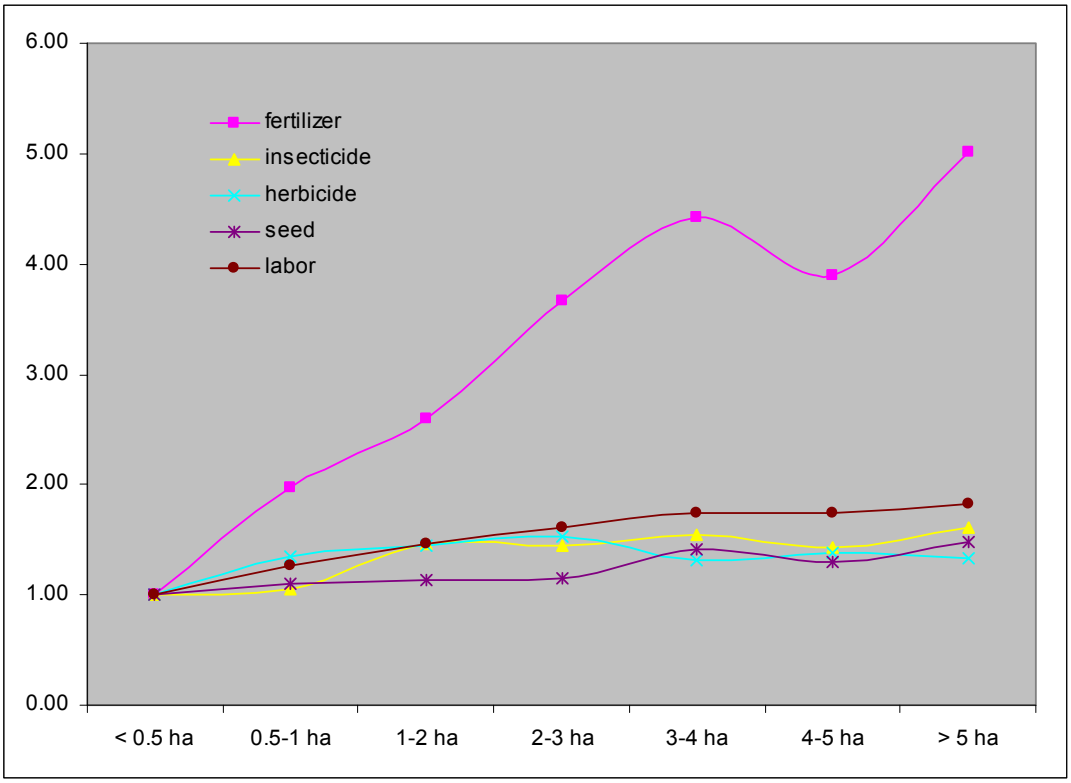


Overall use rates for different inputs (i.e. the share of producers reporting expenditure on a given input) do vary by land holding class, generally being less prevalent at lower holding levels (Table 9). In terms of frequency of use, purchased seed is clearly the most important input for households at the smaller end of the holding spectrum. At higher holding levels, insecticide and fertilizer are much more frequently purchased.

However, these trends vary by input type, suggesting different input sensitivities for farm enterprises of different scales. To help clarify this, Table 10 shows average use rates relative to the use rate of households in the smallest landholding class (<0.5 hectare). Seed, labor and herbicide are relatively flat. Fertilizer use is, on average, a steadily more frequent input at larger holding sizes. This may indicate economies of scale in smallholder input benefit calculations. Insecticide use fluctuates considerably, possibly reflecting a weaker relationship with holding size per se.

Whether or not these input use levels actually translate into higher yields is a matter of speculation at this point. As mentioned above, yield patterns and trends are presented in a subsequent section.

Figure 7: Share of holders using purchased inputs, relative to average share for producers with smallest holdings



Overall trends are intact across major geographical units, although the use of particular inputs varies widely over space, as would be expected given different agro-ecological endowments and production profiles in different parts of the country. The table below shows average use rates by region.

Table 10: Share of holders using purchased inputs, by region

	fertilizer	insecticide	herbicide	seed	labor
Western	18%	23%	14%	15%	37%
Central	16%	9%	3%	14%	40%
Greater Accra	2%	1%	1%	1%	2%
Eastern	14%	13%	19%	15%	33%
Volta	8%	9%	16%	22%	38%
Ashanti	12%	11%	21%	19%	38%
Brong Ahafo	24%	22%	12%	21%	55%
Northern	40%	6%	3%	23%	38%
Upper East	42%	10%	1%	40%	30%

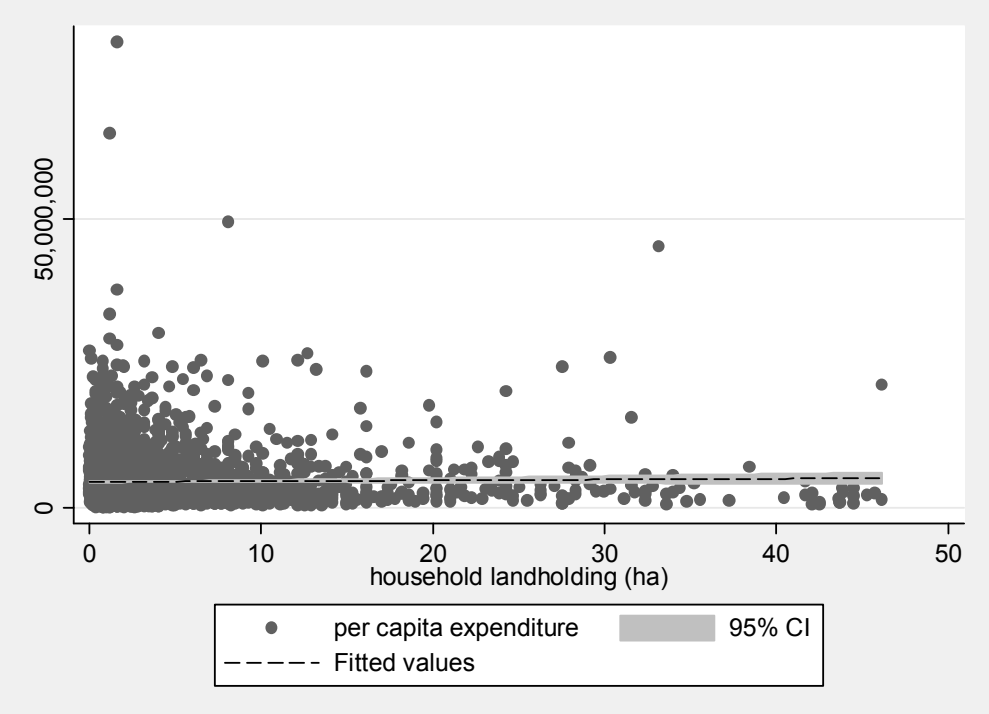
3.6 Smallholder economic welfare

Towards substantiating claims that smallholders comprise the bulk of the rural poor in Ghana presents some challenges. The linkages between holding size and poverty have been established elsewhere (e.g. in several Eastern and Southern African countries, the bottom income quartile of agricultural households is "virtually landless," having < 0.12 hectares per

capita [Jayne et al. 2001]). As a step towards overcoming the largely anecdotal association between holding size and economic welfare in Ghana, the relationship between household landholding and consumption was examined.

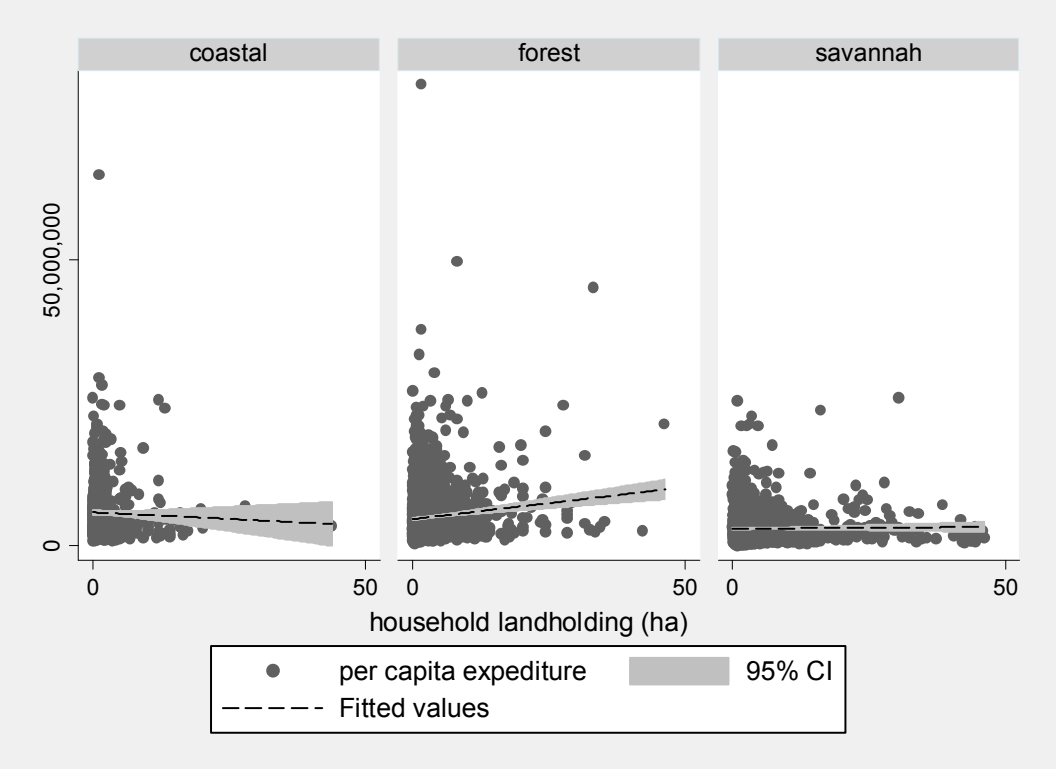
Across all major geographical subgroupings, there is a statistically significant, but generally very weak, correlation between holding size and per capita consumption levels. Figures 8 and 9 show scatterplots of household values for both variables. Correlation coefficients are all highly significant, both sign and magnitude vary considerably. Organized by ecological zone, holding size the coast is weakly and negatively associated with per capita consumption. This may be a partial reflection of greater productivity of small, labor-intensive farms linked with high-value horticulture and other urban markets in the coast. The relationship in the other zones is positive. In the forest zone, holding size explains about 11% of per capita consumption variation, possibly suggesting that larger farms are better able to take advantage of economies of scale. In the savanna zone, however, the relationship is very tenuous, perhaps reflecting the flatter opportunities for income gains from alternative land uses and production strategies in environments with more poorly developed markets.

Figure 8: Per capita consumption and household agricultural landholding



N=5262; Pearson's correlation coefficient is 0.02 (significant at P = 0.01 level)

Figure 9: Per capita consumption and household agricultural landholding, by ecological zone



Coast: n=767; Pearson's correlation coefficient is -0.04
Forest: n= 2356; Pearson's correlation coefficient is 0.11
Savanna: n=2139; Pearson's correlation coefficient is 0.02
All coefficients significant at P = 0.01 level

4. CHARACTERISTICS OF GHANAIAN SMALLHOLDER AGRICULTURE

This section draws primarily on district-level production data from the Statistics, Research and Information Directorate (SRID) of the Ministry of Food and Agriculture (MOFA). District-level data are only available for major commodities and do not include most high-value or export crops. As such, they offer an incomplete picture of the agricultural sector. Nonetheless, these data do provide an important window into the way in which the production of important staple crops has performed. Particularly important are the disaggregated nature of these data, which enables the simultaneous examination of both temporal and spatial heterogeneity at a scale (the district) at which such data are not usually available.

4.1 National trends in production and productivity

National agricultural growth in Ghana has been generally, if not exceptionally, positive in recent years[11]. Average growth rates in agricultural production over the last decade have been positive across all major staples, although have slowed down somewhat from the 1980s (Table 11). These trends mirror somewhat those of Ghana's macroeconomic and poverty reduction stories (Coloumbe and McKay 2006).

Table 11: Average annual production growth rates for major staple crops

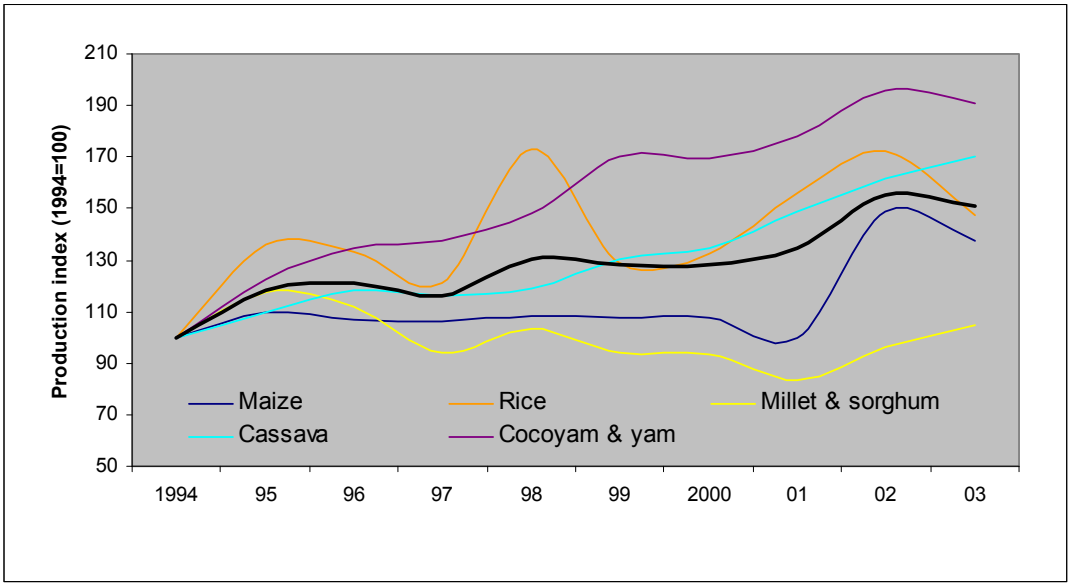
	production (1000s metric tons)				avg. annual growth rates		
	1970-73	**1980-83**	**1990-93**	**2000-03**	**1970s**	**1980s**	**1990s**
Maize	444	273	794	1,160	-4.7%	11.3%	3.9%
Rice	59	43	130	247	-3.1%	11.7%	6.6%
Millet	120	125	130	160	0.5%	0.3%	2.1%
Sorghum	169	140	241	303	-1.9%	5.6%	2.3%
cereals					*-2%*	*7%*	*4%*
Cassava	2,620	2,244	5,013	9,261	-1.5%	8.4%	6.3%
Cocoyam	1,136	797	1,137	1,744	-3.5%	3.6%	4.4%
Yam	776	429	2,140	3,656	-5.8%	17.4%	5.5%
Plantain	1,756	821	1,095	2,153	-7.3%	2.9%	7.0%
roots& tubers					*-5%*	*8%*	*6%*

Source: calculated from SRID-MOFA data

While the patterns of this growth across major staples show broadly similar positive trends, growth has been more volatile for some commodities than others (e.g. rice), relatively flat for maize, and often negative for coarse grains (Figure 10).

[11] According to World Development Indicator data from the World Bank, the annual GDP growth rate for Ghana varied between 3.4 and 5.2 percent during the period 1991 – 2000. Agricultural growth kept pace with this overall growth, for the most part, with 3.97 percent average annual growth during the same period (Diao 2003).

Figure 10: Production growth trends of selected crops, 1994-2003



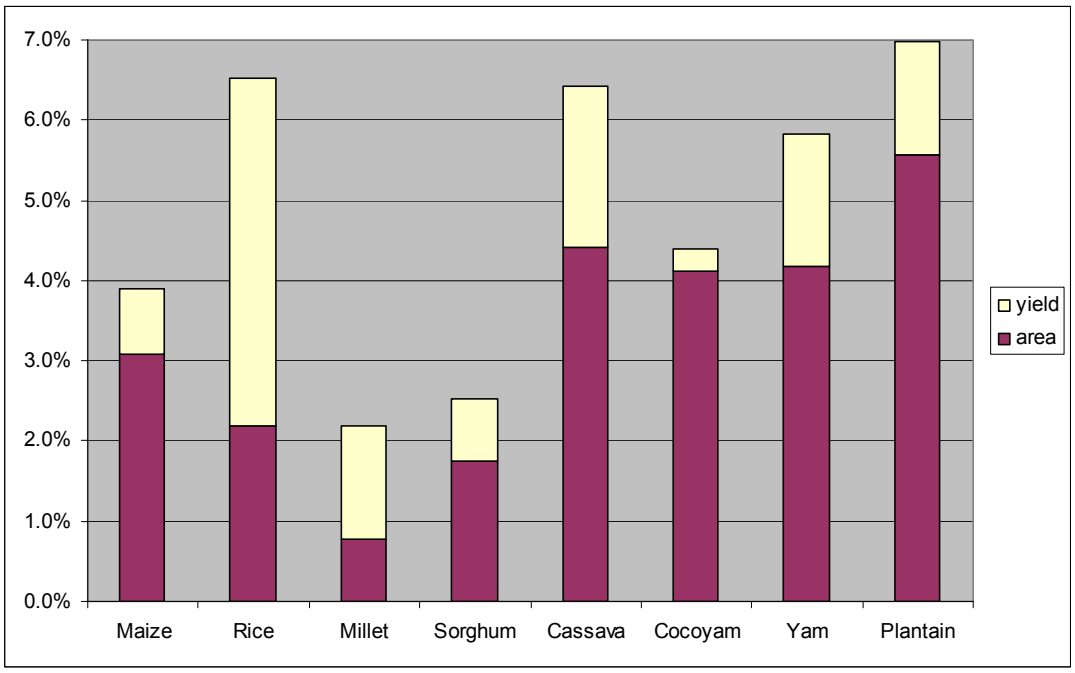
Source: Calculated from SRID-MOFA data

Production growth may derive from one of two things: growth in productivity and growth in harvest area. Looking at yields for the same crops over the same periods (Table 12) we see that area expansion far outstrips yield gains for most crops (rice and millet being the exceptions). Another way of looking at the relationship between these sources of growth is provided by Figure 10, which shows the relative magnitude of these growth rates.

Table 12: Average annual growth rates for major staple crops, 1994-2003

	production	area	yield
Maize	3.9%	3.1%	0.8%
Rice	6.6%	2.2%	4.3%
Millet	2.1%	0.8%	1.4%
Sorghum	2.3%	1.7%	0.8%
Cassava	6.3%	4.4%	2.0%
Cocoyam	4.4%	4.1%	0.3%
Yam	5.5%	4.2%	1.7%
Plantain	7.0%	5.6%	1.4%

Figure 11: Average annual yield and area growth rates, 1994-2003



Given the fundamental context of such growth – i.e. dwindling land available for expansion, high yield gaps for most crops – these trends are clearly worrisome. Sustained growth objectives for the smallholder agricultural sector, which clearly figure in all Ghana's development strategies, will have to take place in a way that offsets such trends.

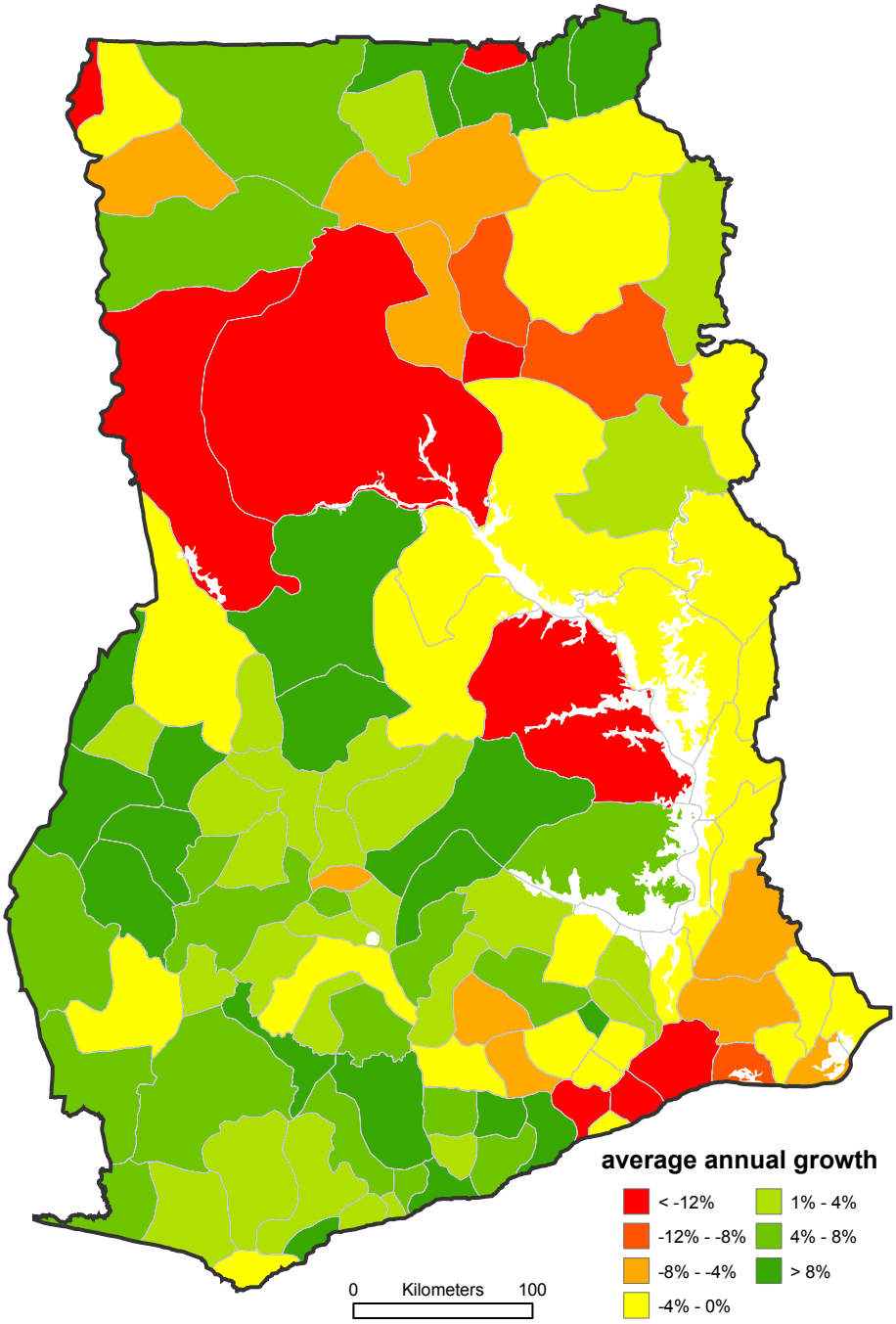
4.2 Sub-national trends in production and productivity

Such patterns of growth, of course, have not been equal everywhere in the country. The map below shows district growth rates for maize over the period 1994-2003. The patterns are complex, suggesting that local conditions rather than simply broad climatological or natural resource base changes are driving these trends. However, there is some spatial dependency in these patterns[12] showing most growth in the forest and transition zones and declining production in the savannah zones. This geographical picture is consistent with the previously presented indications of smaller farm sizes, lower input use and lower commercialization rates in the north of the country.

As with national-level trends, much of the production growth in maize derives from area expansion. Figure 13 graphically shows the share of maize production growth attributable to area expansion. Although the nature of this area expansion is uncertain (e.g. whether derived from production shifts from other crops or from expansion of agricultural activities into formerly non-agricultural land), it raises important questions of sustainability.

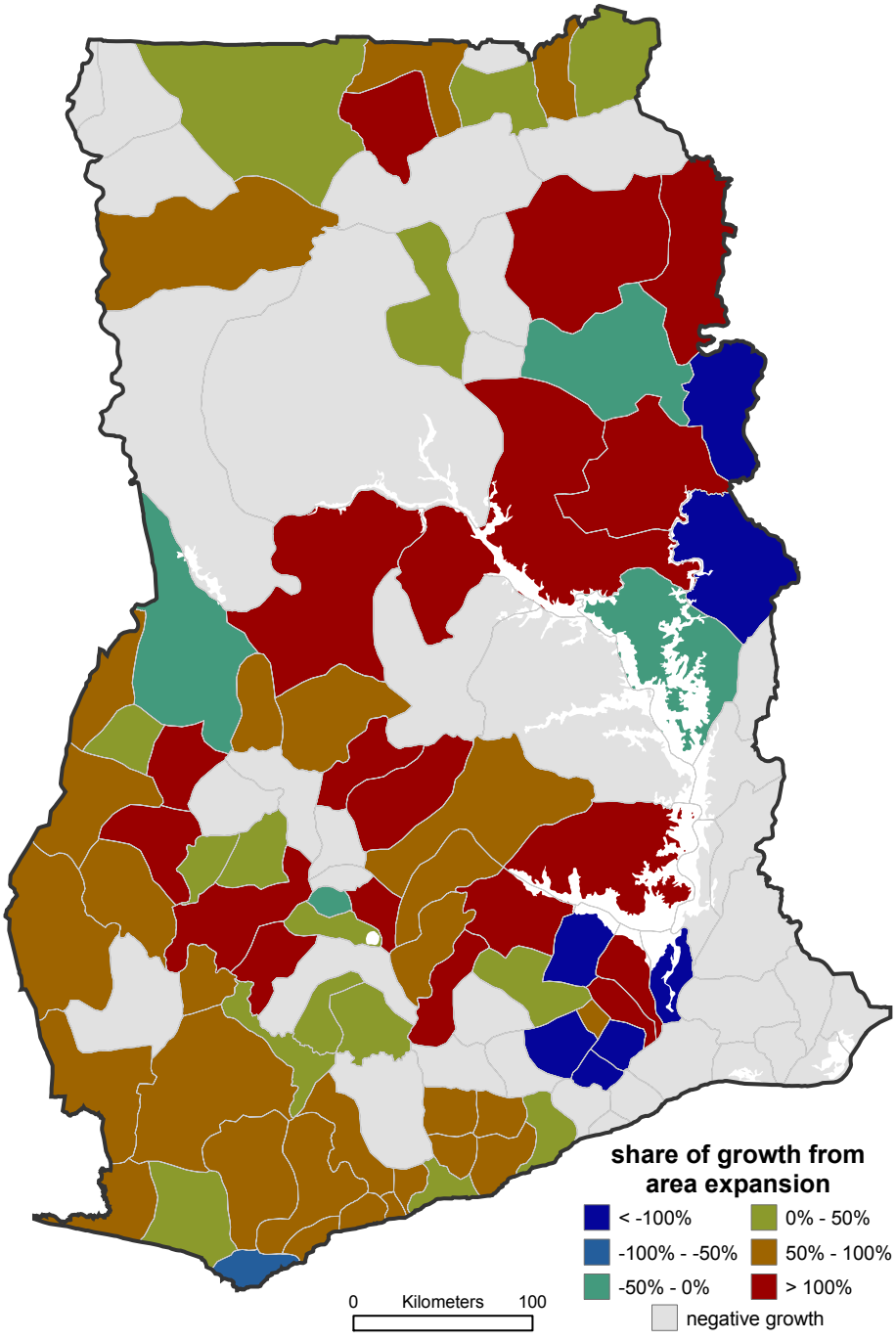
[12] Moran's I statistic is 0.3 when outliers are removed

Figure 12: Average annual district growth rates for maize, 1994-2003



Source: calculated from SRID-MOFA data

Figure 13: Share of district maize growth from area expansion, 1994-2003



Source: calculated from SRID-MOFA data

Sub-national production patterns for other staple crops are somewhat different, of course, reflecting different agroecologies. (Mapped district level trends are shown for all

major crops in Appendix 1.) But two sets of generalizations may be extracted. First, where production is increasing, it is mostly driven by area expansion and where production is contracting, it is mostly driven by declining yields. This is shown below in Table 13, in which the share of national production for each crop is calculated for districts with different production regimes. For example, the first column of numbers shows the percent of total production taking place in districts with declining production in which area contraction is the dominant driver. Similarly, numbers under "increasing production: yield-led" indicate the share of production taking place within districts with increasing production which is driven mainly by yield increases.

Table 13: Distribution of production by share of total

	declining production			*increasing production*			*other**
	area-led	yield-led	*all*	area-led	yield-led	*all*	
maize	6.7%	18.3%	*25.0%*	56.9%	18.1%	*75.0%*	0.0%
rice	8.4%	4.5%	*12.9%*	73.0%	13.7%	*86.7%*	0.4%
millet	18.5%	39.5%	*58.0%*	30.3%	11.6%	*42.0%*	0.0%
sorghum	11.4%	43.8%	*55.2%*	30.2%	14.6%	*44.8%*	0.0%
cassava	6.7%	11.0%	*17.7%*	66.7%	15.0%	*81.7%*	0.6%
yam	4.3%	6.5%	*10.8%*	78.6%	10.6%	*89.2%*	0.0%
cocoyam	12.5%	4.7%	*17.2%*	49.9%	26.7%	*76.6%*	6.2%
plantain	7.9%	8.0%	*15.9%*	72.0%	10.1%	*82.1%*	2.1%
groundnut	0.0%	1.0%	*1.0%*	56.3%	42.8%	*99.0%*	0.0%

* areas with no recorded production in 1994-1996

The second general observation is that growth is concentrated in relatively few places. For maize, for example, the 10 districts with the highest production growth rates only account for 15% of total maize production and are located in a few areas (areas around Kintampo, Sunyani & Agogo in the Deciduous and Transition zones, as well as in Upper East.) While these patterns are different for different crops – the district growth rate of any crop tends to be a poor predictor of growth for any another crop in that district – the pattern of growth gains being concentrated in relatively few areas tends to hold up across crops. Tables 14 through 16 provide some indication of this.

Table 14: Distribution of maize production by AEZ and growth direction

	% of maize production in districts with different production trends		% of national production
	growth	*decline*	
Guinea Savanna Zone	42%	58%	18%
Sudan Savanna Zone	0%	100%	1%
Transition Zone	12%	88%	20%
Decidious Forest	28%	72%	48%
Moist Evergreen	0%	100%	4%
Wet Evergreen	16%	84%	1%
Coastal Savanna Zone	17%	83%	9%
			100%

Table 15: Distribution of cassava production by AEZ and growth direction

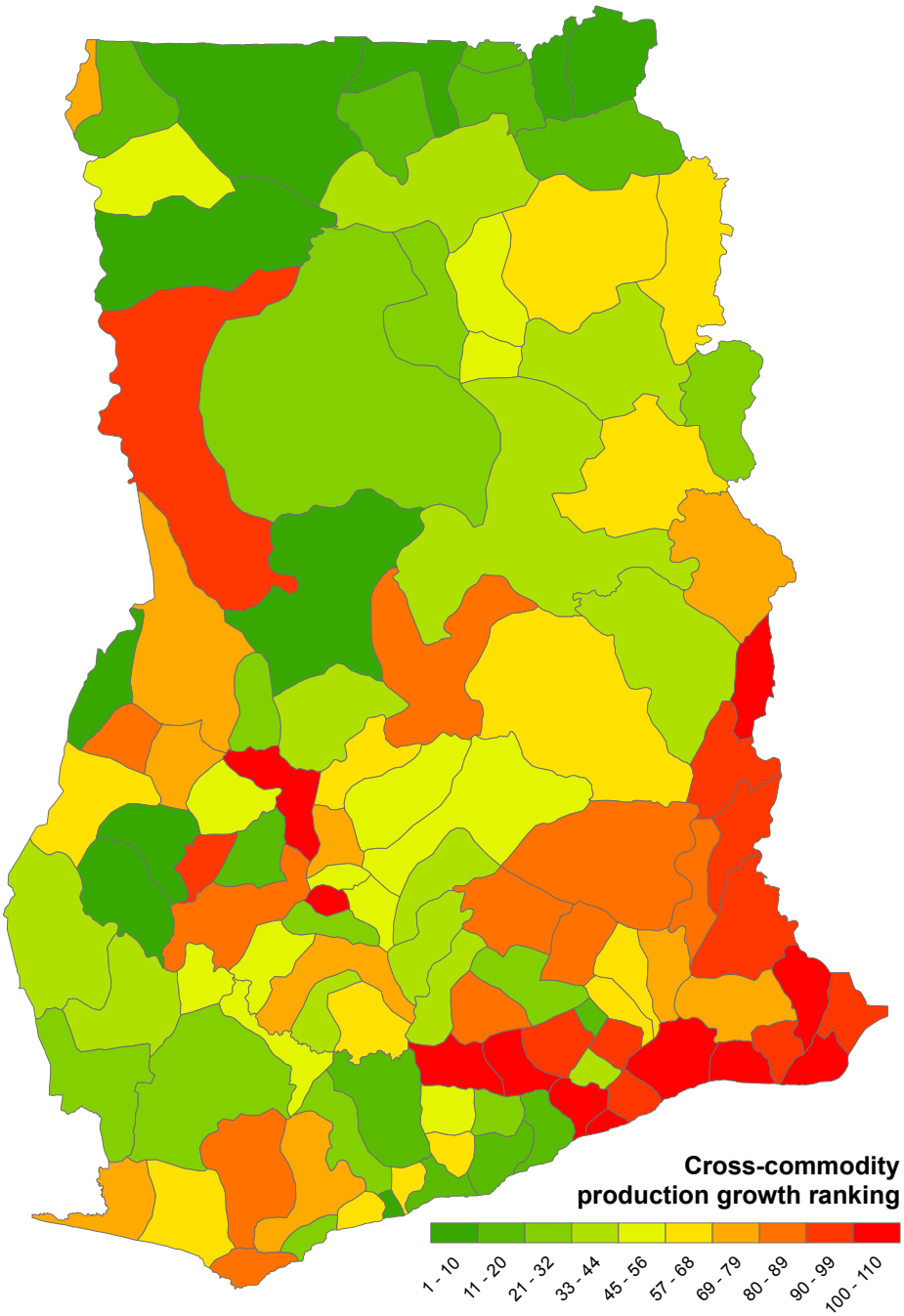
	% of cassava production in districts with different production trends		% of national production
	growth	*decline*	
Guinea Savanna Zone	5%	95%	9%
Sudan Savanna Zone	0%	0%	0%
Transition Zone	23%	77%	19%
Decidious Forest	21%	79%	55%
Moist Evergreen	0%	100%	4%
Wet Evergreen	35%	65%	2%
Coastal Savanna Zone	6%	89%	11%
			100%

Table 16: Distribution of yam production by AEZ and growth direction

	% of yam production in districts with different production trends		% of national production
	growth	*decline*	
Guinea Savanna Zone	25%	75%	32%
Sudan Savanna Zone	0%	0%	0%
Transition Zone	3%	97%	57%
Decidious Forest	11%	89%	10%
Moist Evergreen	0%	100%	1%
Wet Evergreen	0%	89%	0%
Coastal Savanna Zone	2%	96%	0%
			100%

Although growth for different crops is coming from different areas, one way to partially synthesize the growth story is by looking at the average growth ranking across crops. Figure 6 shows the ranking of districts by their average ranking across the 9 major staples for which we have detailed data. Interestingly, many of the areas with the highest overall rankings (shown in green) are in areas with relatively minor contributions to national production.

Figure 14: Ranking of districts by growth rates averaged across 9 major staple crops



Source: calculated from SRID-MOFA data

Part of this story may be due to irrigation and intensive input schemes targeted to poorer areas (e.g. in the Upper West and Upper East). But altogether, the picture that emerges

from these data suggests that the momentum of growth in smallholder agriculture is not likely to continue in the same way for the indefinite future.

5. MARKET ACCESS

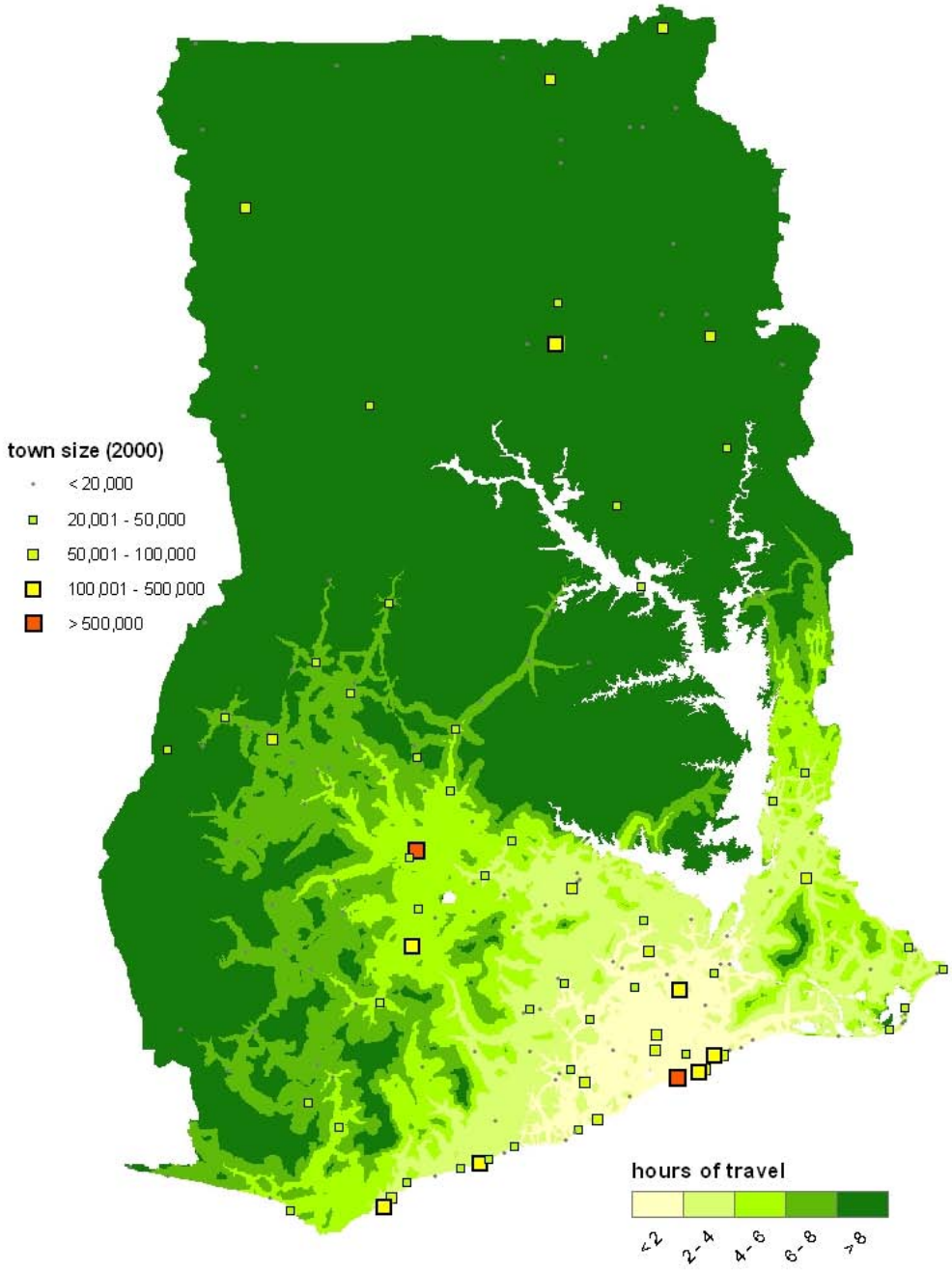
5.1 Defining access to markets

Access to markets is a key constraint to smallholder development from a number of perspectives. Access to output markets for marketable surplus is a key component of sectoral transformation strategies. Access to input markets is linked with this. First, input use is often economic only under conditions of marketable surplus. Second, in well functioning markets, input costs will decrease as access increases (assuming input and output markets are found in the same locations). For these reasons, overcoming access constraints is a central strategic goal for developing agrarian economies.

Of course, access to markets (or anything else) has many recognizable dimensions. Physical and non-physical dimensions of access may be distinguished. On the non-physical side, institutions, information, cultural norms all mediate access to markets for different products which may be biophysically viable in any given location. Technical practices may further interact with these factors to affect smallholder ability to meet grades and standards requirements. But the physical aspects of access are perhaps the most directly measured and conceptually unambiguous. Physical access generally refers to the ease or difficulty of getting goods to or from a market located in a particular place. Conceptually, the role of physical access on economic activities is understood in terms of the transactions costs that different degrees of access imply. Holding other factors equal, higher costs will progressively restrict the economic viability of engaging input and output markets.

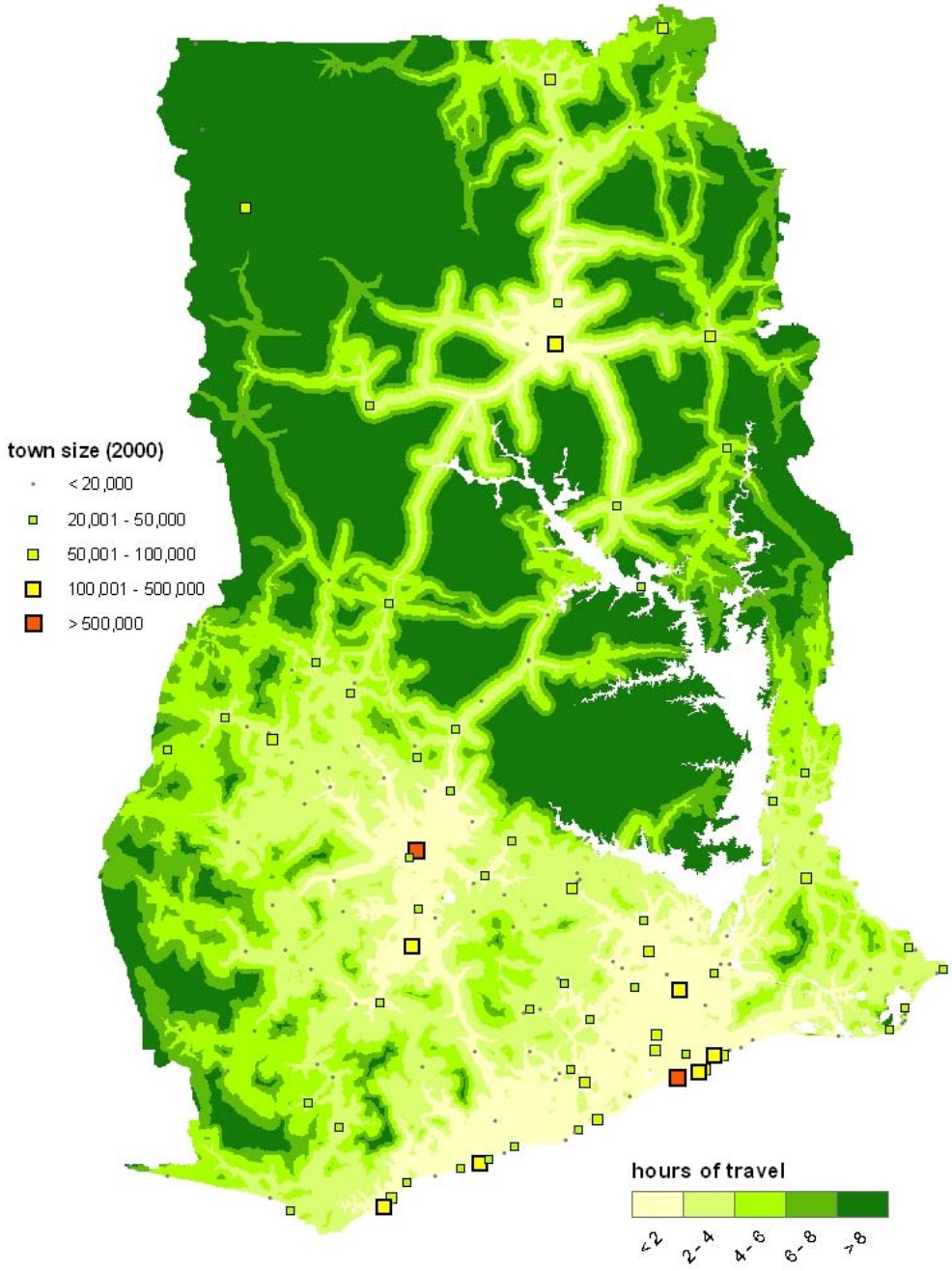
With currently available data, access may be measured in a number of ways. This paper emphasizes physical measures of access, based on estimated average travel time to different markets. Using data on the nature and location of urban centers (representing market opportunities) within a GIS, we may estimate travel times to towns of different sizes. Figures 15-17 illustrate mapped estimates of travel time to various markets.

Figure 15: Estimated average travel time to Accra



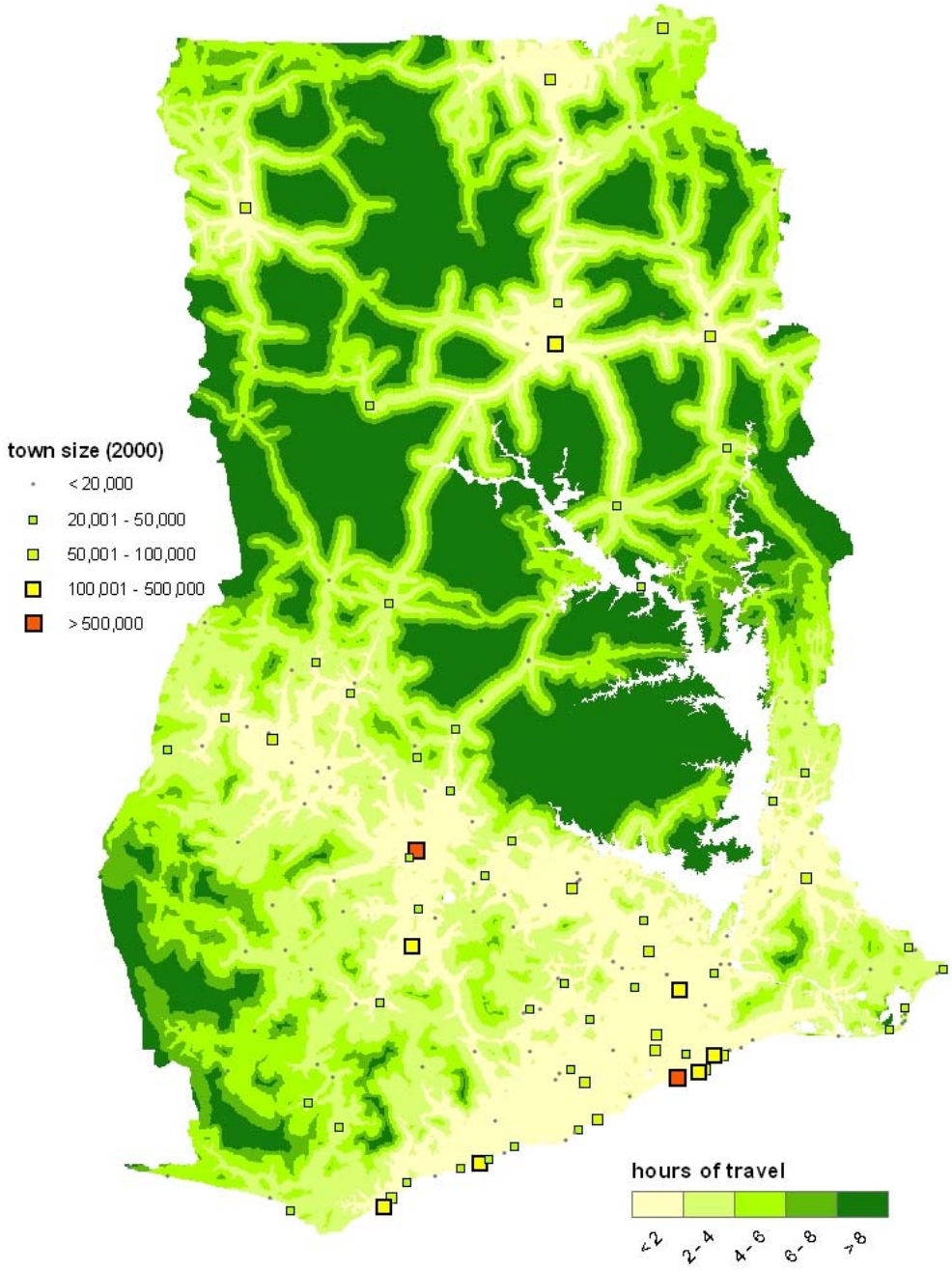
Source: calculated by author

Figure 16: Estimated average travel time to towns of 100,000+



Source: calculated by author

Figure 17: Estimated average travel time to towns of 50,000+



Source: calculated by author

By using such measures as coarse spatial filters for sizing up the access conditions under which smallholders live and work, some insights are gained into the contexts within which efforts to improve market linkages must take place. Tables 17-19 summarize the

approximate numbers of rural poor, rural population and land area which are found under the different conditions represented by the mapped access indicators.

Table 17: Dimensions of access: Accra

	rural poor		population		land area	
distance from market	n	%	n	%	sq.km.	%
< 2 hours of town Accra	574,281	7%	4,215,670	22%	8,325	3%
2-4 hours of town Accra	1,126,430	14%	2,917,100	15%	18,061	8%
4-6 hours of town Accra	958,922	12%	3,719,900	19%	20,731	9%
6-8 hours of town Accra	978,199	12%	2,193,920	11%	26,026	11%
> 8 hours of town Accra	4,557,150	56%	6,185,420	32%	165,329	69%
total	*8,194,982*	*100%*	*19,232,010*	*100%*	*238,472*	*100%*

Table 18: Dimensions of access: towns of 100,000 or more

	rural poor		population		land area	
distance from market	n	%	n	%	sq.km.	%
< 2 hours of town 100k+	1,193,900	15%	8,198,400	43%	23,794	10%
2-4 hours of town 100k+	2,136,120	26%	4,484,240	23%	45,816	19%
4-6 hours of town 100k+	1,507,780	18%	2,672,320	14%	43,966	18%
6-8 hours of town 100k+	1,166,400	14%	1,588,980	8%	35,849	15%
> 8 hours of town 100k+	2,175,260	27%	2,290,040	12%	89,138	37%
total	*8,179,460*	*100%*	*19,233,980*	*100%*	*238,563*	*100%*

Table 19: Dimensions of access: towns of 50,000 or more

	rural poor		population		land area	
distance from market	n	%	n	%	sq.km.	%
< 2 hours of town 50k+	2,465,660	30%	10,021,700	52%	40,408	17%
2-4 hours of town 50k+	2,474,120	30%	4,411,550	23%	55,510	23%
4-6 hours of town 50k+	1,457,520	18%	2,273,670	12%	47,154	20%
6-8 hours of town 50k+	709,217	9%	1,071,090	6%	30,470	13%
> 8 hours of town 50k+	1,088,470	13%	1,455,240	8%	64,930	27%
total	*8,194,987*	*100%*	*19,233,250*	*100%*	*238,472*	*100%*

It is intuitively obvious that bringing more smallholders into commercially oriented production strategies will depend in part on targeting the development of enabling institutions where they can do the most good (i.e., in areas with good physical access) and targeting basic infrastructure (particularly roads, but also communication, extension and other services) to areas of lower access. Of course, targeting will also build upon the underlying production endowment (i.e. an area's absolute advantage for alternative production choices) as well as other targeted objectives. For example, there is evidence that off-farm opportunities for women are linked to the lowest rates of poverty and highest rates of poverty reduction (Newman and Canagarajah 2000). To the extent that off-farm employment is conditioned by physical infrastructure, another targeting aspect of access indicators becomes apparent.

5.2 Constraints and opportunities under current conditions

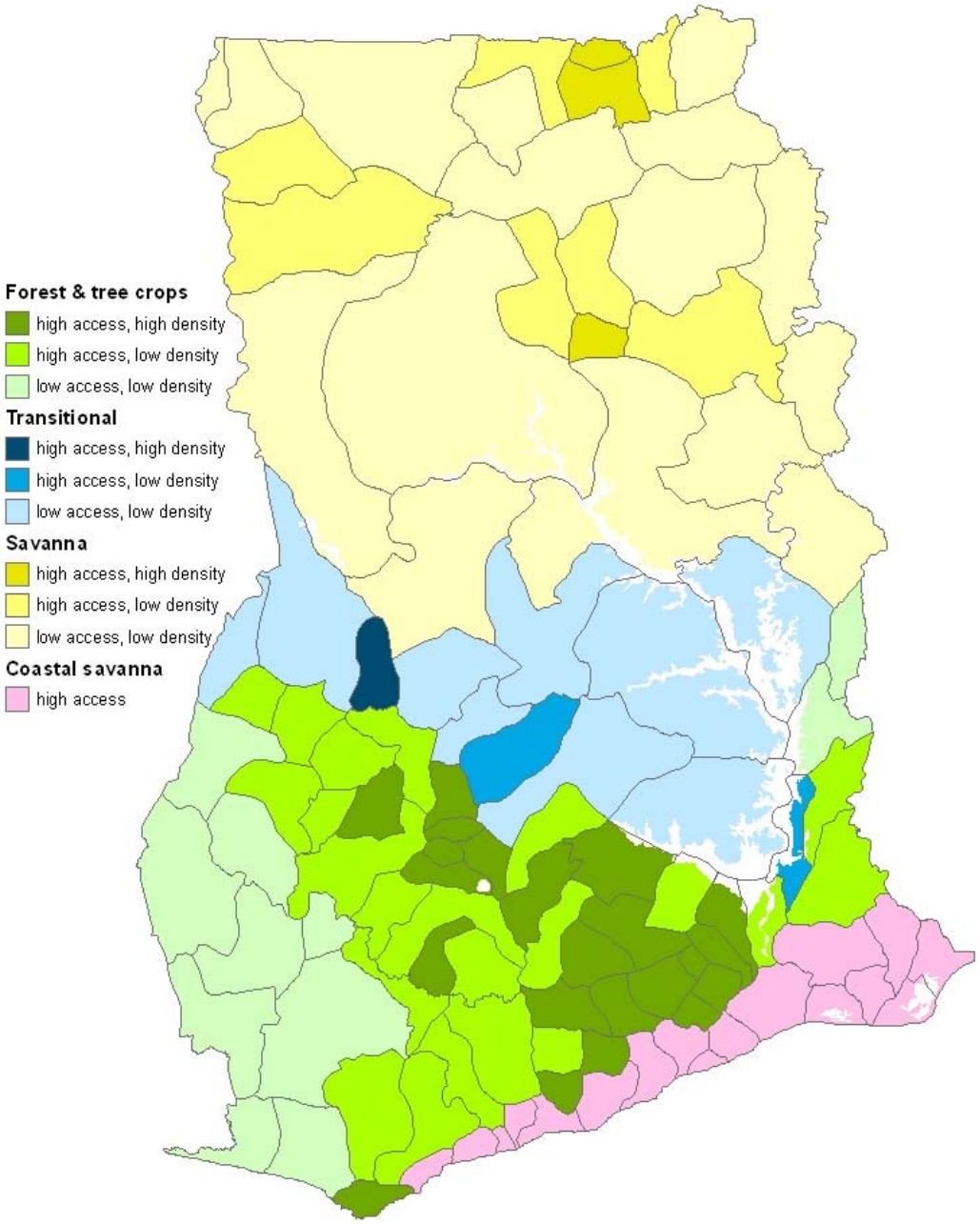
In order to at least partially assemble a coherent understanding of how access relates to other factors in conditioning the success of different market-oriented development strategies, one useful framework is that of "development domains" (Chamberlin et al 2006, Pender et al. 2004, Wood et al. 1999). By defining high market access on the basis of travel time to towns of 50,000 or more inhabitants and then further overlaying these classes with areas high and low population density and fundamental agroecological distinctions, development domains are defined and presented for Ghana[13].

[13] The domains presented here were constructed from district level indicators of the three stratifying factors described above. Agricultural potential is based on an aggregation of major agroecologies: deciduous, moist evergreen and wet evergreen forest zones are grouped together, as are the Guinea and Sudan savanna zones. The traditional delineations of transitional areas and coastal savanna zones are taken as is.

These are overlaid with district indicators of market access and population density characteristics as follows. High market access was defined on a district-level as all districts with more than 20% of their area within 2 hours of a town of 50,000 or more inhabitants (districts not meeting this calculated criterion, but with two or more towns of 25,000 or more inhabitants were also considered high access). Following conventional classification, districts with more than 100 persons per square kilometer were classified as high density.

The resulting district-level classification yields 10 development domains, shown in Figure 5.4. These domains are not presented as a static or necessarily finalized framework but rather as one way in which important conditions can be mapped. They are described in more detail in Chamberlin (2006).

Figure 18: Ghanaian rural development domains



Source: calculated by author

Such a framework allows us to see how much of the rural landscape (including smallholder farmers) are found within different domain conditions across the country. Tables 20 and 21 tabulate land area, rural population and estimated numbers of rural poor by domain.

Table 20: Total land area, population and rural poor by domain

	area (km2)	population (1000s)	rural poor (1000s)
forest & tree crops			
high access, high density	18,008	4,366	1,084
high access, low density	33,177	3,240	1,436
low access, low density	25,589	1,583	601
transitional			
high access, high density	1,135	162	87
high access, low density	3,441	269	129
low access, low density	37,589	1,287	927
savanna			
high access, high density	2,672	525	423
high access, low density	19,675	948	864
low access, low density	85,568	2,213	1,878
coastal savanna			
high access	12,021	4,785	844

Table 21: Domain share of national land area, population and rural poor

	area (%)	population (%)	rural poor (%)
forest & tree crops			
high access, high density	8%	23%	13%
high access, low density	14%	17%	17%
low access, low density	11%	8%	7%
transitional			
high access, high density	0%	1%	1%
high access, low density	1%	1%	2%
low access, low density	16%	7%	11%
savanna			
high access, high density	1%	3%	5%
high access, low density	8%	5%	10%
low access, low density	36%	11%	23%
coastal savanna			
high access	5%	25%	10%
	100%	*100%*	*100%*

Large numbers of the country's smallholders live in conditions of relative remoteness and low population densities, especially in the north. From the earlier discussion of agricultural trends, we may note that such conditions are associated with area expansion-led growth (and declining yields where production is declining). Such areas are also where the highest rural poverty incidences are found (Table 22). Such a picture suggests that these areas may present special challenges to policies to increase smallholder production, productivity and commercialization.

Table 22: Average district rural poverty incidence by remoteness and population density classes

	low acc	high acc
low dens	77.64	60.36
high dens	54.00	51.22

Of course, there are other ways to conceptualize and measure access. The GLSS4 reports on a number of different indicators. Almost 15% of the rural population lives more than a kilometer from a motorable road, and almost 8% live more than 10 kilometers from the nearest public transportation. More than half must travel more than 10 kilometers to reach the nearest bank, and about a third must travel that distance to reach the nearest market. 71% have no access to electricity (either by grid or generator). About 28% are 20 or more kilometers from the nearest post office or public phone. The aggregate picture is one of significant portions of the rural population with relatively poor access to a variety of services.

6. CONCLUSIONS AND SUGGESTIONS FOR FURTHER WORK

Smallholders are indeed prevalent within Ghana's rural economy. More than three-quarters of producer households are farming less than 3 hectares, which is close to the national average. Although smallholdings constitute the bulk of farms throughout the country, there are some discernable regional differences, e.g. the smallest smallholdings (<1 ha) are most prevalent in the south, while holdings at the larger end of the (smallholder) spectrum are more prevalent towards the north. Such differences may be offset by the lower land productivity and lower market access in the north. This argues for geographically flexible definitions of smallholding status, rather than a single definition.

The nature of smallholders is distinct from that of larger farmers. Smallholders produce fewer crops, market less and are less likely to use purchased inputs. Relative to larger producers, smallholder marketing activities are more oriented to food crops. This highlights the fact that efforts to increase smallholder participation in high-value chains should be accompanied by efforts to enhance their participation in the markets they already engage in. Such enhancements might focus on increasing the economic viability of inputs for production destined for local marketing.

The fact that smallholder agriculture tends to be low-input appears to be reflected in the overall production patterns of staple crops in Ghana. Rural development objectives of increasing output from commodities in which smallholders are the primary producers (e.g. roots and grains, particularly maize) will likely face challenges in managing expansion versus productivity growth. This is likely to be particularly acute under conditions of poorer market access and lower population densities. In addition to targeted infrastructure improvements, focusing efforts to improve relevant institutions (e.g. input market development, extension reforms, farmer organizations) may be targeted to such areas.

Household level assessment of productivity as a function of location and holding size would certainly supplement this analysis in informing the targeting of investments. Further work with the GLSS5 data may allow this, although further cleaning of the harvest area data will be necessary.

REFERENCES

Asuming-Brempong, Samuel, Ramatu Al-Hassan, Daniel Bruce Sarpong, George T-M. Kwadzo, Sesi K. K. Akoena, Owuraku Sakyi-Dawson, Akwasi Mensah-Bonsu, Ditchfield P. K. Amegashie, Irene Egyir and Steve Ashley. 2004. Poverty and Social Impact Analysis (PSIA) Studies for Ghana: Economic Transformation of the Agricultural Sector. Final Report submitted to the National Development Planning Commission (NDPC)/ Ministry of Food and Agriculture (MoFA), and DFID, Ghana, for the "Economic Transformation of the Agriculture" Sector Study. Report submitted in June 2004 by the Department of Agricultural Economics & Agribusiness, University of Ghana and Department of Economics, University of Ghana with technical support from The IDL Group, U.K.

Baden, S., Green, C., Otoo-Oyortey, N. and Peasgood, T. (1994). Background Paper on Gender Issues in Ghana. Report prepared for the West and North Africa Department, Depart for Overseas Development (DFID), UK

Chamberlin, J. 2006. Spatial Perspectives on Development Opportunities in Ghana, Draft report submitted to USAID-Ghana under the Ghana Strategy Support Program. International Food Policy Research Institute, Washington D.C., USA.

Chamberlin, J., J. Pender and B. Yu. 2006. Development domains for Ethiopia: capturing the geographical context of smallholder development options. Development and Strategy Division Discussion Paper #43. International Food Policy Research Institute, Washington D.C., USA.

de Janvry, Alain and Elisabeth Sadoulet. August 2005. Access to Land and Development. Brief prepared as an entry for the New Palgrave Dictionary of Economics, 2nd edition, Palgrave Macmillan.

Chemonics. 2006. Trade and Investment Program for a Competitive Export Economy (TIPCEE): Semi-annual Progress Report, October 2005 – March 2006. Report prepared by Chemonics International Inc. for United States Agency for International Development, Washington D.C., USA.

Chipeta S., Hoydahl E. and Krog J., 2003. Livestock Services and the Poor. A Global Initiative – Collecting, Coordinating and Disseminating Experiences. Draft Report, Danida, IFAD and The World Bank.

Coulombe, Harold and Andrew McKay. 2003. Selective Poverty Reduction in a Slow Growth Environment: Ghana in the 1990s. Paper prepared for the World Bank, Human Development Network, September 2003. World Bank, Washington DC.

DFID. 2005. Ghana Project Memorandum: Support to Agriculture Sector Harmonisation (SASH). Department for International Development, Accra, Ghana, September 2005

Deininger, K. 2003. Land Policies for Growth and Poverty Reduction. World Bank: Washington DC.

Dorward. A; J. Kydd and C. Poulton.eds. 1998. "Smallholder Cash Crop Production Under Market Liberalization." Oxon; New York, NY: CAB International c1998

GOG. 2003. Ghana Poverty Reduction Strategy 2003-2005: An Agenda for Growth and Prosperity. Volume I: Analysis and Policy Statement. Government of Ghana, February 2003.

Govereh, Jones, T.S. Jayne, and James Nyoro. 1999. Smallholder Commercialization, Interlinked Markets and Food Crop Productivity: Cross-Country Evidence in Eastern and Southern Africa. Department of Agricultural Economics & Department of Economics, Michigan State University (MSU).

Huvio, T., J. Kola, and T. Lundström, eds. 2005. Small-scale farmers in liberalised trade environment. Proceedings of the seminar, October 18–19, 2004, Haikko, Finland. Department of Economics and Management Publications No. 38. Agricultural Policy. Helsinki: University of Helsinki. http://honeybee.helsinki.fi/mmtal/abs/Pub38.pdf Accessed December 2006.

IFAD. 2006. Republic of Ghana Upper East Region Land Conservation and Smallholder Rehabilitation Project (LACOSREP) Interim Evaluation Executive Summary. International Fund for Agricultural Development. Available on-line: http://www.ifad.org/evaluation/public_html/eksyst/doc/prj/region/pa/ghana/s026ghbe.htm. accessed on 12-12-06.

de Janvry, A. and E. Sadoulet. 2002. World Poverty and the role of agricultural technology: direct and indirect effects. Journal of Development Studies 38 (4): 1-26.

Jayne, T.S., Takashi Yamano, Michael T. Weber, David Tschirley, Rui Benfica, Antony Chapoto and Ballard Zulu. 2003. Smallholder income and land distribution in Africa: implications for poverty reduction strategies. Food Policy 28 (2003) 253–275.

MOFA. 2006. Agriculture in Ghana: Facts and Figures. Annual Report compiled by the Statistics, Research and Information Directorate (SRID), Ministry of Food and Agriculture (MOFA) as part of MOFA's Policy Planning Monitoring and Evaluation activities. Accra, Ghana.

Moser, O. N. C., 1993. Gender Planning and Development; Theory, Practice and Training. Printed by Mackeys of Chatham plc, Chatham, Kent. Great Britain.

Nyanteng, V.K., Seini, A. Wayo. 2000. Agricultural policy and the impact on growth and productivity (1970-1995) In: .Economic reforms in Ghana. The miracle and the mirage. Edited by Ernest Aryeetey, Jane Harrigan and Machiko Nissanke

Owusu-Baah, K. 1995. Technology Adoption by Small-Scale Farmers in Ghana. In: Technology Policy and Practice in Africa. Edited by Osita M. Ogbu, Banji O. Oyeyinka, and Hasa M. Mlawa

Pender, J., P. Jagger, E. Nkonya and D. Sserunkuuma. 2004. Development pathways and Chambers, R. (1989) "Vulnerability, Coping and Policy", IDS Bulletin 20 (2): 1-7.

Pingali, P. 1997. "From Subsistence to Commercial Production Systems: The Transformation of Asian Agriculture," American Journal of Agricultural Economics, 79(May 1997): 628-634.

Shepherd A.W. & S. Farolfi 1999. "Export Crop Liberalization: A Review." FAO Agricultural Services Bulletin 000, ROME.

Timmer, C.P. 1997. "Farmers and Markets: The Political Economy of New Paradigms," American Journal of Agricultural Economics, 79(May 1997): 621-627.

von Braun, J. and E. Kennedy (eds). Agricultural Commercialization, Economic Development, and Nutrition, The Johns Hopkins Press Ltd. Maryland, 1994.

von Braun, J. 2005. Small-Scale Farmers In Liberalised Trade Environment. pp 21-52 in: Huvio, T., J. Kola, and T. Lundström, eds. 2005. Small-Scale Farmers In Liberalised Trade Environment. Proceedings of the seminar, October 18–19, 2004, Haikko, Finland. Department of Economics and Management Publications No. 38. Agricultural Policy. Helsinki: University of Helsinki. http://honeybee.helsinki.fi/mmtal/abs/Pub38.pdf Accessed December 2006.

Wood, S., K. Sebastian, F. Nachtergaele, D. Nielsen, and A. Dai. 1999. Spatial Aspects of The Design and Targeting of Agricultural Development Strategies, Environment and Production Technology Division Discussion Paper No. 44, International Food Policy Research Institute, Washington D.C.