Is Agriculture Central to Achieving the Millennium Development Goal of Halving Poverty by 2015 in Nepal?

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Abstract[4]

Whether accelerated growth of agriculture – through agricultural expenditure, official development assistance (ODA) or investment – makes a difference in achieving the Millennium Development Goal of halving poverty by 2015 (MDG1) in selected low income countries (Bangladesh, Nepal, Cambodia, and Lao PDR) in Asia and the Pacific region is analysed. The prospects of achieving MDG1 ($2/day) are bleak if the historical trends in drivers of agricultural growth continue over the period 2007-2013. The prospects are slightly less bleak if the lower poverty line of $1.25/ day is used. So far as Bangladesh is on track but not the other three countries. Our analysis confirms robustly that increases in agricultural ODA, agricultural expenditure, fertilizer use or agricultural investment would accelerate agricultural and gross domestic product (GDP) growth and, consequently, improve the prospects of achieving the more ambitious MDG1 (US$2 per day). Classification of individual countries into various categories reveals that low-income countries (all four countries studied are included) with weak governance or institutional quality (all four included with some variation), or with low ease of doing business (all four included with some variation), would need larger increases in agricultural ODA, expenditure or investment to achieve MDG1 at both US$2 and US$1.25 per day. These results raise two *related* but *distinct* policy dilemmas: one is the trade-off between real resource transfer to agriculture and institutional reform, and the other is a similar trade-off between resource transfers and the business environment. While the challenge of reducing the scourge of poverty is daunting, the resource requirements for accelerated agricultural growth and institutional reforms delineated here could be the basis for a comprehensive workable policy agenda.

Keywords: Millennium Development Goal (MDG), agriculture, investment, institutions.

1. Context

Poverty is primarily a rural problem in Asia and the Pacific Region (APR). About seventy percent of the poor people in the world live in rural areas and depend on agriculture for their livelihood. Half of all the rural poor (490 million) live in South Asia where the absolute number of rural poor has increased despite

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a decline in the incidence of poverty. More recently, the poor have borne the brunt of the three F (food, fuel, and financial) crises, which has made meeting the Millennium Development Goal of halving poverty by 2015 or MDG 1 (i.e. halving extreme poverty by 2015) a challenge for governments in Asia and the Pacific Region. They grapple with the problem of achieving sustainable growth while simultaneously reducing rural poverty.

It is essential to distinguish between transient poverty and chronic poverty. Failure to distinguish between the two may result in directing resources (under the poverty reduction programs) to those households who are only temporarily poor (error of inclusion) and leaving out those who are actually poor but may temporarily be out of poverty (error of exclusion). The 'chronically poor' have few assets, little or no political voice, and are usually based in remote locations with poor or non-existent public services, high levels of violence, and desperate living conditions. They are victims of social discrimination based on caste, gender, religion, ethnic identity, age, and other factors. They have limited work opportunities, which allow only day-to-day survival. Poor households are handicapped by low income, lack of education, assets, and limited opportunities for economic advancement. Rural poverty is a multidimensional phenomenon, which includes along with income, other intrinsically important dimensions such as lack of education and assets, and limited opportunities for economic advancement, among others.

Rural women, youth, and indigenous peoples experience such disadvantages disproportionately, making it harder for them to exit from poverty. Women, particularly in the developing countries, are more likely to be engaged in the informal sector, which offers low wages, no formal social protection, and limited opportunity to gain skills. Disparities continue to exist between men and women in the workplace and in wages. Controlling for occupational differences, women on average earn around 50 percent of what men earn in the South Asian countries. Similarly, in Asia and the Pacific Region the youth (who constitute 61.5 percent of the 1 billion worldwide) live predominantly in rural areas, and require assistance to escape poverty and lead better and more fulfilling lives. Many children (0-14 years) and youth (15-24 years) are unable to reach their potential because of poverty, hunger, poor health, and lack of education and skills. Poverty encourages child labor, which is common in developing countries. Of the 900 million poorest of the poor people in the world, at least one third are indigenous peoples and more than half live in Asia and the Pacific Region. Most of them are socially, politically, and economically marginalized, endangering their survival in a rapidly changing environment.

Poverty is not just a matter of deprivation but also of vulnerability to exogenous shocks. Shocks can trap people in poverty by eroding their assets and capabilities to a point that they are unable to accumulate enough to move out of poverty. The shocks may be linked to climate change, pest outbreaks such as avian influenza, food price fluctuations, illness, and death. Rural communities and households have a range of mechanisms for coping with downturns. As risk-coping mechanisms, households often resort to selling productive assets, borrowing, depleting savings, migrating, and reducing expenditure on food, healthcare, and education notably affecting women and children. Although they have developed relatively strong risk-management and risk-coping strategies, vulnerability remains high. Asia and the Pacific Region is also highly vulnerable to fluctuations in energy markets due to its high dependence on fossil fuels. This has considerable impact in terms of vulnerability to food insecurity. Some parts of the region (e.g. Afghanistan, Sri Lanka, Nepal, Indonesia, the Philippines, and Pakistan) are also affected by instability and conflict, or have recently recovered from conflict.

2. Objective

The objective of the present study is to analyse the role of agriculture in achieving MDG1 halving of extreme poverty (estimated at the poverty cut-off point of $1.25) and moderate poverty estimated at the higher cut-off of $2 per capita by 2015, relative to the level in 1990 in selected low income countries in the APR with a focus on Nepal[5]. In this analysis, we will first estimate the likely contribution of agriculture to GDP growth and its implications for both extreme and moderate poverty. The next step is to assess the prospects of poverty reduction through extrapolations of historical trends in various drivers of agricultural growth: agricultural expenditure, investment, and ODA in agriculture. If the likely or expected poverty reduction falls short of the desired, counterfactual simulations are carried out to illustrate required ranges of increases in these variables. Attention will be drawn to improvements in institutional quality to accelerate growth and poverty reduction. Questions relating to policy dilemmas arising from trade-offs between resource transfers and improvements in institutional quality will also be addressed.

After providing context and objectives of the study, Section 3 turns to the salient features of the Nepalese economy in the context of other low income countries such as Bangladesh, Lao PDR, and Cambodia. This is followed by a

[5] GNI per capita is used to classify countries as low income, lower middle income, and upper middle income. For details, see WDI 2011.

discussion of poverty estimates in these countries in Section 4. The data and model specification used for analysing agriculture's role in poverty reduction are discussed in Section 5. In Section 6, the results obtained are used to simulate the effects of various drivers of agricultural growth on poverty in these countries. Section 7 draws together the main findings from a broad policy perspective.

3. Salient Features of Nepalese Economy[6]

Nepal has experienced a downswing phase circumscribed by poverty and stagnation. Agriculture–essentially subsistence–is a source of livelihood for 70 percent of the population. Disguised unemployment is pervasive; rural indebtedness and poverty are high; and 74 percent of the households possess less than one hectare of land. Recent comparison illustrates that Nepal's economy is lagging behind other member countries in the SAARC region.

Macroeconomic indicators are worrying–a GDP per capita growth rate of 2.5 percent annually with inflation hovering around 10 percent. Merchandise exports have declined in recent years resulting in a huge trade deficit. A negative balance of payments with gross international reserves just enough to pay for imports of merchandise goods and services for a little over 7 months is a source of vulnerability. Although remittances rose markedly, their growth rate declined from 51 percent in FY 2008/09 to 10.1 percent during FY 2010/11. The FDI stagnated around Rs 58 billion in mid-March 2010. Earnings from tourism declined from 4.1 percent of GDP in 1994-95 to 2.4 percent in 2010/11. Although revenue/GDP ratio is estimated to be 15.3 percent with growing fiscal deficit, internal revenue mobilisation is likely to fall short of supplementing capital expenditures. Capital expenditure (about 39 percent of the estimated budget of Rs 385 billion for FY 2011/12) is much lower than required due to absence of enduring peace and stability and poor investment-friendly environment.

Nepal is going through a critical phase marked by growing inefficiency, corruption, and political entrenchment that could jeopardise development. Although it enjoys a strategic location, its geophysical limitation and landlocked situation have impaired its prospects of enhancing its competitiveness and trade. In fact, in recent years, it has lost its comparative advantage in conventional exportable products at the regional and international markets, and new high-value crops suitable for exports. Commercialisation of agriculture is hampered by fragmented plots. Besides, the inflow of FDI and domestic investment have been adversely affected by inadequate infrastructure and poor industrial relations with rigid labor laws and tax regulations. Apart from political instability,

[6] This draws upon an excellent review by Dahal (2011).

corruption is rife. Nepal, in fact is among the most corrupt countries in South Asia.

4. Poverty in selected Asian countries

Table 1 gives poverty estimates for selected low income countries in APR.

In Bangladesh, extreme poverty ($1.25/day) rose over the period 1983-1992 and then fell during 1996-2005. Nearly half the population was extremely poor in 2005. A similar pattern is revealed when the higher poverty line ($2/day) is used. Not surprisingly, about 82 percent of the population was moderately poor in 2005.

Table 1: Poverty estimates in selected Asian countries

Country	Year	Poverty Headcount (US$1.25/day)	Poverty Headcount (US$2/day)
Bangladesh	1983	47.4	
	1986	43.0	81.7
	1988	52.5	
	1992	66.8	92.5
	1996	59.4	87.5
	2000	57.8	85.4
	2005	49.6	81.3
Cambodia	1994	48.6	77.9
	2004	40.2	68.2
	2007	25.8	57.8
Lao PDR	1992	55.7	84.8
	1997	49.3	79.9
	2002	44.0	76.9
Nepal	1985	78.1	93.4
	1996	68.4	88.1
	2004	55.1	77.6

Source: IFAD (2011), Imai et al. (2011) and WDI (2011).

Cambodia exhibited a sharp reduction in extreme poverty over the period 1994-2007, with a little over quarter of the population extremely poor in 2007. A similar pattern is obtained when the higher poverty cut-off of $2/day is used, with nearly 59 percent of the population moderately poor in 2007.

Lao PDR recorded a reduction of about 12 percentage points in extreme poverty over a 10-year period, 1992-2002. However, the incidence of extreme poverty was high (44 percent). Using the higher poverty cut-off point ($2/day), the reduction was lower (about 8 percentage points), with well over three-fourths of the population poor.

In Nepal, extreme poverty fell from about 78 percent to 55 percent during 1985-2004 – an annual reduction of about 1.21 percentage points. But well over half of the population was extremely poor in 2004. Moderate poverty also fell from over 93 percent to about 78 percent – an annual reduction of 0.83 percentage point. Thus, among all these low income countries, extreme poverty was highest in Nepal (subject of course to the caveat that the years of comparison are not the same) but moderate poverty was lower than the highest in Bangladesh. Thus the challenge of poverty reduction in Nepal is daunting.

These statistics, however, do not reveal large within-country variations, especially between the remote mountainous regions and the rest. Box 1 illustrates this.

Box 1: Interregional variations in poverty in Bhutan, Nepal, and India

National poverty estimates do not reveal the differences between remote mountainous and other regions. Not only is poverty incidence often much higher in the former, but the rate of reduction over time is also much slower *despite* substantial economic growth. Some illustrative evidence, based on a detailed analysis of household data for Nepal and Bhutan, is summarised below.

In Nepal, poverty is much higher in the mountainous region. By contrast, while the mountainous parts of India are not poorer than the rest, there are marked disparities among the different states of the Indian Himalayan region. Although all of Bhutan is mountainous, Eastern Bhutan lags far behind the rest in terms of poverty and other proximate indicators of well-being (e.g. access to basic amenities and connectivity to markets).

A striking contrast emerges from a comparison of poverty across different regions in Nepal. In the mountains and hills, the headcount ratio of poor declined from 47.7 percent in 1996 to 40 percent in 2003; in the plains, the reduction was from 40.3 percent to 27.6 percent; and, in Kathmandu Valley, from a low of 7.2 percent to 3.7 percent. In both Bhutan and Nepal, there is a strong systematic relationship between isolation and poverty, as remoteness in terms of limited access to roads, markets, and public services (mainly education and health care) is correlated to prevalence of poverty. Besides, greater vulnerability to natural hazards (e.g. wind storms, landslides) is compounded by absence of social protection.

The policy implications of such disparities in living standards are profound. Whether low population densities in such remote areas impede policy outreach merits close scrutiny.

Source: ICIMOD (2010), and IFAD (2011).

Rural poverty has declined rapidly in APR over the past decade (from 1057 million to 687 million). This has been on account of an extraordinarily fast decline in the number of rural poor in East Asia. In the last three decades, poverty in this sub-region has declined by about two-thirds. While it had over 500 million rural poor two decades ago, the number today stands at just 117 million. Rural poverty in South East Asia declined, too, over the period.

However, the decline was seen only in the last decade. Amongst the Asia-Pacific sub-regions, South Asia has the largest number of poor rural people. Further, the absolute number of rural poor in this region increased before it started to decline somewhere around 2000. Despite the reduction in South Asia, the number of rural poor today is higher than what it was two decades earlier (IFAD, 2011).

Despite wide-ranging diversities in the region, many poor rural people in Asia and the Pacific Region are either landless or own a limited piece of land, possess large families, are less educated, and have limited access to credit and technology. In addition, lack of market information, business and negotiating experience, and collective organisations deprive them of the power to compete on equal terms in the marketplace. Box 2 delineates the characteristics and determinants of poverty in Laos and Cambodia.

Box 2: Determinants of rural poverty in Laos and Cambodia

In Laos, poverty is primarily a rural problem. In 2002-03, about 86 percent of the poor lived in rural areas. This fell to about 81 percent in 2007/8. Also, the rural headcount index was just under twice as high as in urban areas (31.7 percent and 17.4 percent, respectively). The spatial and temporal variations in poverty in Laos can be explained by geography, market access through roads, and ethnicity. Overall poverty is higher in the Uplands (relative to the Lowlands); it is also higher in villages without access to roads (relative to those with access); it is higher among the Mon-Khmer and Hmong-lu Mien minorities, relative to the Lao-Tai majority.

In Cambodia, the chances of being poor vary negatively with household head's age but at a diminishing rate. Large households are more likely to be poor. On the other hand, male-headed households and Khmer households are less likely to be poor. There are lower risks of poverty among small and large farmers, relative to the landless and marginal farmers. Security of land title has a significant role in lowering the risk of poverty. Presumably, this acts as an incentive to making longer-term investments in technology that enhance yields. Educational attainments have large poverty reducing effects. Diversified sources of income act as a cushion against market and other shocks. The larger the proportions of households using electricity and irrigation in a village, the lower the chances of being poor. As lack of market access constrains income earning opportunities (for example, remunerative prices for agricultural produce), access to an all-weather road lowers the risk of poverty, pointing to the priority of expanding access to all-weather roads in a rural poverty reduction strategy.

Source: Gaiha and Annim (2010), and Gaiha and Azam (2011).

A stylized fact about rural poverty in many parts of Asia and the Pacific Region is that the poorer rural households derive the highest proportion of their incomes from farming and agricultural labor, while the better-off households derive the most from non-farm activities. Given the constraints on farm expansion and continuing growth of the rural population, greater attention is

being given to non-farm activities in view of their potential for economic development and poverty reduction. In fact, countries that have succeeded in sustained rural poverty reduction have generally promoted both agriculture and non-farm rural economy (IFAD, 2011). Occupational diversification is also a major way of managing risk for poor people with few risk management options. Development of rural non-farm economy (RNFE) is especially important for women and groups that are disadvantaged in agriculture.

It is now well recognized that income poverty is poverty of only one kind. Economists and policymakers have argued powerfully for the need to take a multidimensional approach to poverty and deprivation (Sen, 1999; Alkire and Santos, 2010). Multidimensional poverty includes other intrinsically important dimensions along with income. For instance, rural poverty can be defined primarily in terms of non-income deprivations. Interlocking disadvantages often reinforce each other, and thus contribute to making it even more difficult to move out of poverty. Alkire and Santos (2010) construct a multidimensional poverty index (MPI) for households across 104 countries. The MPI is measured using ten indicators based on health (mortality and nutrition), education (years of schooling and child enrolment), and standard of living (electricity, sanitation, water, flooring, cooking fuel, and ownership of consumer durables). The indicators chosen are along the lines of the Millennium Development Goals (MDGs).

While the estimates of income poverty and MPI are likely to differ, it is striking that some of the low income countries in APR have high incidences of both income poverty (>0.25 and MPI (>0.25). Regardless of whether income poverty is estimated using the $1.25 or $2 cut-off, Bangladesh, Cambodia, Laos, and Nepal exhibit high incidences of both income poverty and MPI. This overlap should not be taken to imply that mitigating income deprivation alone will help mitigate others. On the contrary, a broader anti-poverty agenda is needed that will address interlocking but distinct deprivation in income, health, and education.

Within rural societies, women, youth, and indigenous people are often disproportionately affected by disadvantages that tend to make mobility out of poverty even harder. However, people in these groups possess capabilities and assets (e.g. indigenous knowledge systems) that could be tapped to enhance their well-being. Unfortunately, social and political power distribution tends to undermine their ability to utilize these assets to move out of poverty (IFAD, 2011).

4.1 Structural Characteristics

Although all four countries are classified as low income, there are some differences. Going by Table 2, Nepal is the poorest in terms of GDP per capita, followed by Bangladesh, Cambodia, and Lao PDR. Their growth rates differ, too, over the period 2005-2010. The lowest growth was recorded by Nepal (2.5 percent annually), more than twice as high by Bangladesh (5.6 percent), slightly higher than Bangladesh's by Cambodia (6.10 percent), and highest by Lao PDR (7.4 percent). Their dependence on agriculture varied, too, as shown in Table 3.

Table 2: GDP per capita PPP (constant 2005 international $)

Year	GDP per capita, PPP (constant 2005 international $)			
	Bangladesh	Cambodia	Laos	Nepal
2001	1002.7	1100.5	1399.1	924.0
2002	1028.9	1156.5	1458.1	904.1
2003	1065.1	1237.7	1523.6	918.9
2004	1114.6	1348.1	1596.8	941.2
2005	1164.6	1508.0	1684.6	953.8
2006	1226.4	1650.9	1800.9	966.4
2007	1290.7	1799.0	1907.4	980.3
2008	1356.3	1898.1	2018.7	1021.0
2009	1419.0	1878.7	2139.3	1047.0
2010	1488.3	1968.1	2307.8	1075.4

Source: WDI 2011.

Bangladesh's share of agriculture in GDP was lowest–about 19 percent. There was a slight reduction over the period 2005-2010. Cambodia had the highest share along with Nepal (about 36 percent). While Cambodia witnessed a slight increase over the period 2005-2010 (from 32.4 percent to 36 percent), Nepal did not record any change. In Lao PDR, however, there was a moderate reduction (from 36.4 percent to 33 percent).

As cereals matter for food poverty (defined generally in terms of calorie deficiency relative to a norm), the rate at which their yields grow matters (Gaiha and Annim, 2010; Gaiha and Azam 2011; and IFAD, 2011). Comparison of cereal yields growth rate over the period 1999-2005 shows that the lowest growth was recorded by Nepal (1.8 percent annually), a slightly higher rate by Bangladesh (2.8 percent), Lao PDR (3.5 per cent), and Cambodia (4 percent)[7].

[7] For details, see WDR (2008).

Table 3: Share of agriculture in GDP (%)

	Agriculture, value added (% of GDP)			
Year	**Bangladesh**	**Cambodia**	**Laos**	**Nepal**
2001	24.1	36.2	51.2	37.6
2002	22.7	32.9	50.4	38.6
2003	21.8	33.6	48.2	37.5
2004	21.0	31.2	46.7	37.2
2005	20.1	32.4	36.4	36.3
2006	19.6	31.7	35.2	34.6
2007	19.2	31.9	35.9	33.6
2008	19.0	34.9	34.9	32.7
2009	18.7	35.7	35.2	34.0
2010	18.6	36.0	33.0	36.1

Source: WDI 2011.

As agricultural ODA helps supplement public expenditure in agriculture–especially in low income countries–some illustrative estimates point to varying dependence of these countries on the former over the period 2003-2005. The share of agricultural ODA in total ODA was lowest in Bangladesh (2.4 percent) and highest in Lao PDR (13 percent). Between this range were Nepal (7.5 percent) and Cambodia (10.9 percent). That these shares do not vary in accordance with the need to raise cereal yields growth rates or even the relative importance of agriculture in GDP is disquieting.

5. Data and Results

5.1 Data

Our poverty estimates are the new World Bank headcount poverty estimates, based on the poverty lines of US$1.25 and US$2 per day, adjusted by purchasing power parity (PPP) in 2005 (Chen and Ravallion, 2008). While the poverty estimates based on US$1.08 per day in 1993 PPP were widely used in the studies of the first Millennium Development Goal (MDG1) target, the new poverty estimates cover a larger number of countries and are assumed to be more reliable (ibid.). These estimates are taken from the World Bank's *PovcalNet*[8] website and *World Development Indicators 2010* (World Bank, 2010). They cover 21 countries[9] in the Asia and the Pacific region over the period 1980-2006.

[8] Data are available at http://iresearch.worldbank.org/PovcalNet/povcalSvy.html (accessed 23 December 2010).

[9] They are: Bangladesh, Bhutan, Cambodia, China, India, Indonesia, the Islamic Republic of Iran, Kazakhstan, the Kyrgyz Republic, the Lao People's Democratic Republic, Malaysia, Nepal, Pakistan, Papua New Guinea, the Philippines, Sri Lanka, Tajikistan, Thailand, Timor-Leste, Uzbekistan, and Viet Nam.

The variables used in the regression analyses are listed in annex A with their data sources. Most of the variables are in logarithm to facilitate computation of elasticity estimates. Institutional data were taken from the World Bank's World Governance Indicators database. The data cover 1998, 2000, 2002, 2003, 2004, 2005, and 2006. The methodology for constructing the institutional indicators is discussed in Kaufmann, Kraay, and Mastruzzi (2008).[10]

Different specifications are used to capture unobservable country-specific effects and to allow for endogeneity of some key variables (e.g. agricultural value added, public expenditure in agriculture, and ODA in agriculture). These are discussed in annex B.

5.2 Results

This section discusses econometric results based on the different specifications, derived from a sample of countries in the APR.[11] The key findings are: (i) agricultural expenditure (first lag) and agricultural ODA positively and significantly affect (the first lag of) agricultural value added; (ii) poverty headcounts are negatively associated with log GDP per capita, which is positively affected by (lagged) agricultural value added; (iii) poverty is positively associated with the expenditure/income Gini coefficient, but the estimate is not significant. Thus agricultural ODA indirectly reduces poverty after taking account of its endogeneity; and public expenditure in agriculture also indirectly reduces poverty (i.e. through its positive effects on agricultural value added and GDP).

The elasticity of poverty with respect to the second lag of agricultural ODA is -0.092 in Case 1 and -0.128 in Case 2.[12] In Case 1 (or Case 2), a 1-percent increase in annual agricultural ODA on average reduces poverty by 0.092 percent (or 0.128 percent), given the baseline poverty at US$2 per day in 2006. As the effect of agricultural ODA on poverty is cumulative over the years, the long-term effect of an increase in agricultural ODA on poverty (e.g. from 2006 to 2015) can be substantial.

The elasticity of poverty with respect to the first lag of agricultural expenditure in Case 3 is 0.351, which is larger than 0.202 in Case 1, given the larger coefficient estimate of lagged agricultural value added in the GDP equation (2.582) in Case 3. Poverty elasticity with respect to agricultural

[10] Full data are available at http://info.worldbank.org/governance/wgi/index.asp (accessed 23 December 2010).
[11] For details, see annex B.
[12] For details of Cases 1-5, see annex B.

expenditure is larger than that of agricultural ODA.[13] In Case 4, the poverty elasticity with respect to fertilizer use is 0.287. When agricultural investment is used, in Case 5, the corresponding poverty elasticity is -0.349. This result, though plausible, cannot be accepted at face value, given the extrapolation of investment. Moreover, the small sample (26) precluded the use of country dummies.

The same models are also applied to the poverty headcount ratio on the US$1.25-per-day poverty line. The results are similar, except that the coefficients are generally higher, implying greater sensitivity of poverty indices at the lower poverty line.

A result of considerable policy significance is that, in *all* cases, poverty elasticity with respect to agricultural value added is substantially larger than that of GDP. In fact, it is almost twice as large as the corresponding elasticity with respect to GDP.

In sum, the results corroborate robustly that: (i) agriculture is important not just for economic growth, but also for poverty reduction; and (ii) increases in agricultural ODA, expenditure, investment, and fertilizer (as a proxy for technology) tend to reduce poverty. Thus both national governments and donors have important roles in accelerating agricultural growth and poverty reduction.

6. Simulations

We report here selectively our simulation results on the feasibility of MDG1 on the poverty lines of $2/day and $1.25/day, respectively. As several different specifications are used, a range of estimates is obtained.

In each case, we first compute expected poverty in 2015 based on the assumption that predetermined variables, such as agricultural ODA, expenditure, and investment, follow the historical trend in 1980-2006. If expected poverty in 2015 is less than 50 per cent of poverty level, based on US$2 per day in 1990 (or MDG1), it is inferred that the country is on track to achieve MDG1. In each case, MDG1 is compared with the expected poverty in 2015, and the necessary increase in agricultural ODA (or agricultural expenditure, fertilizer use or agricultural investment) is computed for the period 2007-2013, *relative* to the baseline scenario, where these variables follow the historical trend.

While the necessary increase in factors associated with growth in agriculture varies for different countries, depending on the current level of poverty or the share of agriculture in GDP, our simulations confirm that

[13] We should not, however, straightforwardly conclude that agricultural ODA is more effective than agricultural expenditure, as the estimates of agricultural ODA are extrapolated.

increases in agricultural ODA, agricultural expenditure, fertilizer use, and agricultural investment are important in achieving MDG1.[14] As the results are voluminous, our remarks are *selective*.

As may be noted from Table 4, the prospects of achieving MDG 1 ($2/day) are bleak for low income countries - especially for the 4 selected for the present study. The required increases vary with the different specifications and the details are given in Imai et al. (2011). To avoid repetition, we shall confine our remarks to the cases 1, 4, and 5 to illustrate the magnitudes of key drivers of agricultural growth in order to achieve halving of moderate poverty.

Table 4: Simulation results for Poverty Headcount Ratios ($2/day) in selected low income countries in APR in 2013-15 (baseline year 2006)

Country	MDG1 ($2/ day)	Whether on track to achieving MDG1?	Case1: with agricultural ODA and expenditure		Case 4: with fertiliser use	Case 5: with agricultural investment
			(%) Required rate of annual growth of agricultural ODA (2007-13)	(%) Required rate of annual growth of agricultural expenditure (2007-13)	(%) Required rate of annual growth of fertiliser use (2007-13)	(%) Required rate of annual growth of agricultural investment (2007-13)
Bangladesh	44.5	No	7%	4%	3%	2%
Cambodia	38.9	No	12%	7%	2%	7%
Lao PDR	42.4	No	9%	5%	2%	3%
Nepal	45.5	No	9%	5%	4%	6%
Low Income Countries	37.6	No	14%	8%	3%	7%

Source: Imai et al. (2011)

For low income countries in general, the required increases (or annual growth rates) are not too daunting (over and above the historical rates). ODA in agriculture must increase at an annual rate of 14 percent; agricultural expenditure at a rate of 8 percent; fertilizer use at a rate of 3 percent and agricultural

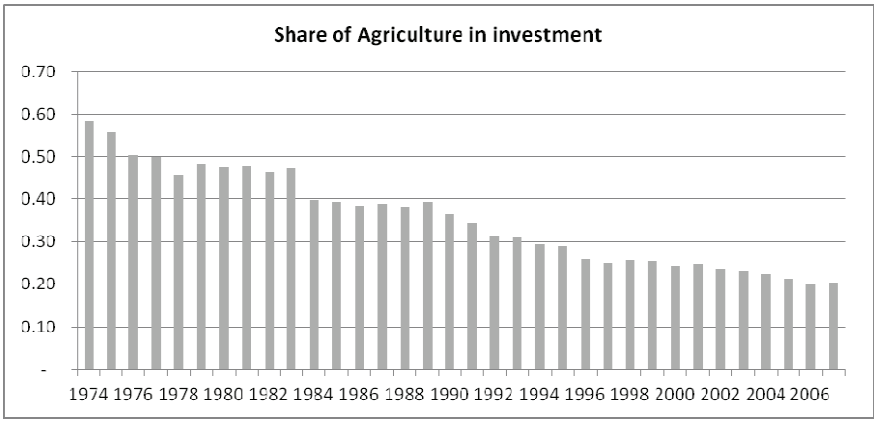
[14] Note that the simulation results are essentially back-of-envelope calculations. A cautious interpretation is necessary, given that: (i) estimates of agricultural ODA and agricultural investment are extrapolated; (ii) the impact of each factor on poverty differs across countries, but the elasticities are averaged across countries (and being averages of large samples are more stable); and (iii) simulations are carried out under the assumption of 'other factors being unchanged'. But these limitations are imposed by patchy data on key variables.

investment at 7 percent. Among the four countries, Cambodia's requirements are mostly large: agricultural ODA should increase at 12 percent annually; agricultural expenditure, as also investment, at 7 percent; and somewhat surprisingly fertilizer use at a low rate of 2 percent. In comparison, Nepal's requirements are lower: agricultural ODA must increase at an annual rate of 9 percent; agricultural expenditure at 5 percent; fertilizer use at a faster rate of 4 percent; and agricultural investment at a slightly lower rate of 6 percent. Bangladesh's requirements are lower than those of Nepal. Lao PDR would require rates of growth of ODA and agricultural expenditure that are same as Nepal's but lower rates of growth of fertilizer use and agricultural investment.

If we base our simulations on the poverty line of $1.25/day (or MDG1 of halving extreme poverty by 2015), the outlook for low income countries is not so bleak. Bangladesh, for example, is on track to achieving MDG 1 but the remaining three will need greater resources than implied by historical trends (but lower than for halving moderate poverty). Cambodia's ODA growth rate, for example, would be 7 percent annually (as compared with 12 percent for halving moderate poverty) and agricultural expenditure would be 3 percent (as against 7 percent). Nepal's ODA growth rate would also be considerably lower (3 percent as compared with 9 percent annually in the previous case), as also that of agricultural expenditure (1 percent compared with 5 percent in the previous case). Thus the prospects of halving extreme poverty seem less daunting.

However, two important caveats remain. Some of these drivers of agricultural growth have declined (for example, ODA in agriculture). So even modest increases are likely to be difficult. Agricultural investment poses another difficulty - lack of reliable estimates for recent years. For our analysis, these estimates are extrapolations of limited and patchy data. For Nepal, however, we have fairly detailed and recent agricultural investment estimates. A graphical representation in Fig. 1 shows a decline in the share of agricultural investment in total investment, with an annual reduction of 3.20 percent (CBS 2009, Thapa 2011). So a reversal of these trends is a first priority, followed of course by required increases. Whether these increases are feasible depends crucially on whether donors would fulfill their commitments with recession looming large in the global economy and limited fiscal space among the low income countries.

Figure 1: Share of agricultural investment in total investment in Nepal (%)



Simulation results are also aggregated for specific categories: (i) whether a country is in the low- or middle-income group; (ii) whether it is among the top 30 countries in the developing world in terms of aggregate governance or institutional quality; (iii) whether the trade share (or the share of imports and exports in GDP) is low (below 50 percent), middle (50-100 percent) or high (above 100 percent); and (iv) whether the rating of the World Bank's Ease of Doing Business Index[15] is low (above 150), middle low (100-150), middle high (50-100) or high (below 50). This index ranks countries according to their regulatory environment or ease of doing business, ranging from 1 to 183. A high ranking means that the regulatory environment is more conducive to the starting and operation of a local firm. The index averages a country's percentile rankings on a variety of indicators. This is meant to supplement the institutional analysis. A selection of the results is given below.

As expected, low-income countries (including Nepal, Cambodia, and Lao PDR) would need a higher increase in agricultural ODA (an annual increase of 14 percent over 2007-2013 for US$2; a 8 percent increase for US$1.25, over and above the baseline scenario) than would middle-income countries (an 11 percent increase over 2007-2013 for US$2; a 4 percent increase for US$1.25).[16] Similarly, the necessary increase in agricultural investment over 2007-2013 is substantially higher for low-income countries (7 percent annually for US$2) than for middle income ones (1 percent for US$2). For the purpose of poverty reduction in terms of both US$1.25 and US$2 per day, donors should mainly

[15] Data are available at www.doingbusiness.org/rankings.
[16] Recall that Cases 1 and 2 differ as to whether their effects are estimated jointly or singly. Given the overlap between the two variables, more precise estimates are ruled out.

concentrate ODA in the agriculture sector of low-income countries, but *without* neglecting middle-income ones.

On the issue of governance, countries that rate low (e.g. Nepal, Cambodia) would need more agricultural ODA, agricultural expenditure, fertilizer use or agricultural investment to achieve MDG1 on both US$2- and US$1.25-per-day criteria. In particular, the requirement for increasing agricultural investment seems demanding for these countries. A policy dilemma that must be confronted is whether 'triggers' for institutional reform could partly compensate for higher transfers of resources to agriculture in low-rated countries.[17]

By contrast, trade openness is not amenable to easy generalization, partly because some of the poorest countries are highly trade dependent (e.g. Cambodia), but more affluent ones as well (e.g. China). Countries with low trade openness would need *higher* levels of increase in agricultural ODA, agricultural expenditure or fertilizer use, but *lower* levels of increase in agricultural investment. While a higher degree of trade openness is generally associated with economic growth and poverty reduction, it may also lead to the neglect of agriculture if not globally competitive. Whether a quick transition out of agriculture is desirable, let alone feasible, seems contentious. Our results imply that, even if a country is open to the rest of the world, substantial agricultural investment is needed for poverty reduction for MDG1 at both US$1.25 and US$2 per day.

Finally, countries with less business-friendly regulatory environments (e.g. Nepal) would need larger increases in agricultural ODA, agricultural expenditure, fertilizer use, and agricultural investment. As in the case of governance or institutional quality, the policy dilemma is whether efforts should be directed toward improving the business environment and/or ensuring greater transfer of resources to agriculture.

7. Concluding Observations

This paper has examined whether accelerated growth of agriculture – through agricultural expenditure, ODA or investment – makes a difference in the prospects of achieving MDG1 in selected low income countries (Bangladesh, Nepal, Cambodia and Lao PDR) in Asia and the Pacific region (using both US$ 1.25 and US$ 2 per-day poverty criteria). The prospects of achieving MDG1 ($2/day) are bleak if historical trends in drivers of agricultural growth continue

[17] A few institutional triggers suffice here. For the rule of law to prevail, a better reporting of crime and insurgencies may help; for the management of corruption, an initiative such as the right to information, which allows official documents to be placed in the public domain, has had visible effects in India; and for the right to property, land titling may facilitate other protective measures.

over the period 2007-2013. The prospects are slightly less bleak if the lower poverty line of $1.25/ day is used, in so far as Bangladesh is on track but not the remaining three.

Our analysis confirms robustly that increases in agricultural ODA, agricultural expenditure, fertilizer use or agricultural investment would accelerate agricultural and GDP growth and, consequently, improve the prospects of achieving the more ambitious MDG1 (US$2 per day). Resource requirements are substantially lower in these low income countries when the MDG1 is defined at the lower poverty line ($1.25/day).

Aggregation of the simulation results for individual countries into various categories reveals that low-income countries (all four countries studied are included) with a low level of governance or institutional quality (all four included with some variation), or with low ease of doing business (all four included with some variation), would need larger increases in agricultural ODA, expenditure or investment to achieve MDG1 at both US$2 and US$1.25 per day. These results raise two *related* but *distinct* policy dilemmas: one is the trade-off between real resource transfer to agriculture and institutional reform, and the other is a similar trade-off between resource transfers and business environment. Our earlier work discussed 'triggers' for institutional reform (e.g. right to information, land titling, better reporting of crime, and insurgencies). While some examples exist of how well these triggers work, policymakers and donors need to reflect on more-cost-effective and more-encompassing triggers, as institutional reform is not merely a by-product of growth or a casual factor. Indeed, arguments abound suggesting that institutional reform and growth may occur simultaneously, making it harder to pinpoint areas of intervention.

Another important insight that our analysis yields is that not just national governments, but also donors, need to commit larger resources to agriculture – especially in many of the poorest countries. Mechanisms that would ensure larger budgetary outlays and donor funds for agriculture, and their allocation between rural infrastructure and sustainable technology, call for deeper scrutiny.

One specific concern, however, is the limited fiscal space in the selected countries (with some variation). While recent estimates of fiscal deficits are available for a small number of countries, it is noteworthy that, while Nepal and Cambodia had low fiscal deficits in 2001-06, Bangladsh's was relatively high. So, although fiscal space may not be a severe constraint, larger public outlays for agriculture-especially public investment - may impose difficult choices. A related concern is, of course, enhanced efficiency of public expenditure in agriculture.

In conclusion, while the challenge of reducing the scourge of poverty is daunting, the resource requirements for accelerated agricultural growth and institutional reforms delineated here could be the basis of a comprehensive and workable policy agenda.

Annex A. List of variables

log Poverty: log of poverty headcount ratio based on US$2-per-day poverty line in *t*, 1980-2006, for the country *i*[18] (World Bank 2010; PovcalNet)

log Poverty Gap: log of poverty gap based on US$2-per-day poverty line (World Bank 2010; PovcalNet)

log GDP pc: log of GDP per capita

log Agri VA(-1): log of agricultural value added per agricultural worker in the previous period, t-1 (World Bank 2010)

log Fertilizer Use(-1): log of fertilizer consumption (kg per ha of arable land) (World Bank 2010)

log Agri Expenditure(-1): log of agricultural expenditure per rural population (Statistics of Public Expenditure for Economic Development [SPEED], International Food Policy Research Institute).[19] Used synonymously with 'public expenditure in agriculture'.

log Agri ODA(-1): log of ODA to agriculture per rural population (World Bank 2007, 322-323; World Bank 2010)

log Agri Investment(-1): log of investment in agriculture sector per rural population (investment data from Harvard University's Centre for International Development)

log Gini Coef.: log of Gini coefficient of income/consumption distribution (PovcalNet)

Annex B. Econometric specifications

Different specifications are used to capture unobservable country-specific effects and to allow for the endogeneity of some key variables (e.g. agricultural value added [Agri VA], public expenditure in agriculture [Agri Expenditure] and ODA in agriculture [Agri ODA]). These are discussed below[20].

Case 1

The following system of equations is estimated by three stage least squares (3SLS) to identify direct and indirect determinants of poverty in a country using panel data.

$$[\text{log GDP pc}]_{it} = \alpha_0 + \alpha_1 [\text{log Agri VA}]_{it-1} + D_i * \alpha_2 + e_{it} \quad (1)$$

where *i* denotes country and *t* denotes year (from 1980 to 2006); $[\text{log GDP pc}]_{it}$ is log of GDP per capita; and $[\text{log Agri VA}]_{it-1}$ is log of agricultural value added per agricultural worker in the previous year, t-1. Following Imai, Gaiha and Thapa

[18] Subscripts *t* and *i* are omitted below.

[19] SPEED data are available at www.ifpri.org/book-39/ourwork/programs/priorities-public-investment/speed-database (accessed 23 December 2010).

[20] For further details, see Imai et al. (2011).

(2010), we consider the effect of agricultural income in the previous period on GDP per capita. In this case, we take account of country fixed effects by including D_i, a vector consisting of country dummy variables in each equation.[21] However, because we do not have sufficient observations in our unbalanced panel data, we cannot include year dummies; e_{it} (as well as ε_{it}, ϵ_{it} and ζ_{it}) is an error term that is assumed to be independent and identically distributed.

$$[\log \text{Agri VA}]_{it-1} = \beta_0 + \beta_1[\log \text{Agri Expenditure}]_{it-1} + \beta_2[\log \text{Agri ODA}]_{it-1} + D_i*\beta_3 + \epsilon_{it} \quad (2)$$

where agricultural value added is estimated by public expenditure on agriculture/agricultural expenditure and ODA in agriculture (or agricultural ODA), both normalized by rural population; $[\log \text{Agri Expenditure}]_{it-1}$ (or log of lagged agricultural expenditure) is a predetermined and weakly exogenous variable and is used as an instrument for $[\log \text{Agri VA}]_{it-1}$.

$$[\log \text{Poverty}]_{it} = \gamma_0 + \gamma_1[\log \text{GDP pc}]_{it} + \gamma_2[\log \text{Gini Coef.}]_{it} + D_i*\gamma_2 + \varepsilon_{it} \quad (3)$$

where [log Poverty] is log of poverty headcount ratio (or poverty gap), based on the US$2 (or US$1.25)-per-day poverty line in *t*, for country *i;* [log Gini Coef.] is log of Gini coefficient of income distribution. Here, poverty is premised as a function of the level of overall economic development, measured by GDP per capita, and the degree of income inequality in a country. It is assumed that higher inequality is associated with higher level of poverty. While GDP is hypothesized to reduce poverty, inequality increases it.

$$[\log \text{Agri ODA}]_{it-1} = \delta_0 + \delta_1 [\log \text{Agri ODA}]_{it-2} + \delta_2 [\log \text{Agri VA}]_{it-2} + D_i*\delta_3 + \zeta_{it} \quad (4)$$

$[\log \text{Agri ODA}]_{it-1}$ is estimated by its lag and $[\log \text{Agri VA}]_{it-2}$ to take account of a likely two-way causality between agricultural value added and agricultural ODA; $[\log \text{Poverty}]_{it}$ is either poverty headcount ratio (or poverty gap) at US$2 (or US$1.25)-per-day poverty line.

Cases 2 and 3

Case 2 is the same as Case 1 except that log Agri Expenditure (first lagged) is dropped from equation (2) on the presumption that a part of agricultural ODA is used for public expenditure in agriculture. Owing to lack of data, however, it is difficult to measure the overlap between them.[22] Hence, we use only log of Agri ODA (first lagged) in Case 2, or only log of Agri Expenditure (first lagged) in Case 3, in order to identify the effect of each factor on agricultural value added. In Case 3, equation (4) for log Agri ODA_{it-2} is dropped. Country fixed effects, or D_i, are included in these cases.

[21] These are unobservable country-specific effects (e.g. how 'welfarist' is a political regime?) that are not captured by any of the right side variables used in the GDP equation.

[22] In Cambodia, for example, public expenditure on agriculture fluctuates with ODA.

Case 4

In another specification, we have replaced [log Agri Expenditure]$_{it-1}$ by [log Fertilizer]$_{it-1}$ in equation (2) in Case 3. Agricultural ODA is not inserted in this case as its coefficient estimate turned out to be non-significant.

$$\textbf{[log Agri VA]}_{it-1} = \beta_0 + \beta_1 \textbf{[log Fertilizer]}_{it-1} + D_i * \beta_3 + \epsilon_{it} \qquad (2)'$$

where [log Fertilizer Use]$_{it-1}$ is log of fertilizer consumption (kg per ha of arable land).

Case 5

$$\textbf{[log GDP pc]}_{it} = \alpha_0 + \alpha_1 \textbf{[log Agri VA]}_{it-1} + e'_{it} \qquad (1)'$$

$$\textbf{[log Agri VA]}_{it-1} = \beta_0 + \beta_1 \textbf{[log Agri Investment]}_{it-1} + \epsilon'_{it} \qquad (2)'$$

$$\textbf{[log Poverty]}_{it} = \gamma_0 + \gamma_1 \textbf{[log GDP pc]}_{it} + \gamma_2 \textbf{[log Gini Coef.]}_{it} + \varepsilon'_{it} \qquad (3)'$$

In Case 5, we replace fertilizer by log of lagged investment in agriculture per capita for rural areas. Agricultural ODA is not included in equation (2)' as the coefficient estimate is not significant. Here, due to the small number of observations on agricultural investment ([log Agri Investment]$_{it}$), we cannot include country or year dummies. Also, as the data on agricultural investment are highly limited, we should interpret the results with caution.[23]

REFERENCES

Alkire, S. and M. Santos. 2010. Acute Multidimensional Poverty: A New Index for Developing Countries. *OPHI Working Papers No. 38*.

Central Bureau of Statistics, Nepal (CBS). 2009. *The System of National Accounts*. Kathmandu: CBS.

Chen, S. and M. Ravallion. 2008. The Developing World is Poorer than We Thought, but No Less Successful in the Fight against Poverty. *Policy Research Working Paper WPS 4703*. Washington, DC: World Bank.

Dahal M. K. 2011. Nepalese Economy: A Critique. *Nepalnews*, 17 August 2011.

Gaiha, R. and S. Annim .2010. Agriculture, GDP and Prospects of MDG 1 in Lao PDR, *School of Economics Discussion Paper 1012*, University of Manchester, mimeo.

Gaiha, R. and Md. Azam. 2011. *Agriculture, GDP and Prospects MDGI: A Study of Cambodia in Transition*. APR, IFAD, in preparation.

ICIMOD .2010. *Understanding Mountain Poverty in Bhutan, India and Nepal, Regional Repor*t, mimeo.

IFAD. 2011. *Agriculture-Pathways to Prosperity in Asia and the Pacific*, Asia and the Pacific Division, Rome.

Imai, K., R. Gaiha, and G. Thapa. 2011. Role of Agriculture in Achieving MDG 1 in Asia and the Pacific Region. *Occasional Paper 14*, IFAD, Rome.

[23] Agricultural investment estimates are available only for 1980-1992 for a limited number of countries. Hence we have regressed agricultural investment on total capital formation and agricultural expenditure during 1980-1992. Based on the regression results, we obtained out-of-sample predictions of agricultural investment in 1993-2006.

Kaufmann, D., A. Kraay, and M. Mastruzzi. 2008. Governance Matters VII: Aggregate and Individual Governance Indicators, 1996-2007. *World Bank Policy Research Working Paper No. 4654*. Washington, DC: World Bank.

Sen, A. 1999. *Development as Freedom.* Oxford University Press: New York.

Sen, A. 2000. A Decade of Human Development. *Journal of Human Development*, 1(1), 17-23.

Thapa, Y. B. 2011. *Updated Notes about Investment on Agriculture in Nepal*, 17 June 2011 (mimeo).

World Bank. 2007. *World Development Report 2008: Agriculture for development*. New York: Oxford University Press.

World Bank. 2010. *World Development Indicators 2010.* Washington, DC: Oxford University Press.

World Bank. 2011. *World Development Indicators 2010.* Washington, DC: Oxford University Press.

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