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Small farms: Changing structures and roles in economic development

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Joachim von Braun and Alisher Mirzabaev

Small Farms: Changing Structures and Roles in Economic Development

Bonn, October 2015

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Joachim von Braun and Alisher Mirzabaev

Abstract

Small farms are the largest employment and small business group among the poor. Their businesses use mostly labor and local resources and face local constraints, but at the same time, they are affected by increasingly complex national and global economic changes, which lead to shifts in optimality and viability of structures and of their business priorities. This paper identifies basic forces of change in the small farm economy, proposes policies that may support productive and socially acceptable transformations, and highlights research priorities. The paper concludes that policies should primarily focus on people's income opportunities in the rural economy, where small farmers often hold multiple farm and non-farm jobs, rather than be narrowly concerned with viability of the small scale farm enterprise.

Keywords: small farms, structural change, farm size, sustainability, poverty reduction, innovation

JEL codes: 013, O33, Q01, Q12

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1. Introduction[1]

There are about 570 million small farms in the world, if we define smallness by hectare (Lowder et al. 2014). About 80% of these small farms are located in Asia, with the majority in China and India. Small farms are the largest employment and small business group among the poor. Their businesses use mostly local resources and face local constraints, but at the same time, they are affected by increasingly complex national and global economic changes, which lead to shifts in optimality and viability of structures and business priorities of small farms. These changes are partly inside farming and partly very much outside agriculture, and partly domestic and partly international, i.e.:

- returns to **labor** in small scale farming are increasingly determined outside agriculture through more integrated labor markets; opportunity costs of farm labor are rising, as are the aspirations of youth in farming families who do not want to feel relatively deprived;
- agricultural **innovation and technology** shifts are critical among the forces of change. Integration with services is increasingly facilitated through innovations in information and communications technologies (ICT) and related richness of relevant content of ICT for farmers and rural communities;
- the market value of smallholder **land** is rising because of agricultural price changes and is increasingly influenced by non-agricultural demand for land use, as well as expected value changes in other capital asset classes;
- **international demand side dynamics** result from changing price levels and volatility, and trade policies defining competitiveness. Consumption shifts are among the fundamental drivers.
- domestic **policies**, especially the scale and pattern of investments in public goods, such as infrastructure, innovation systems, and social policies change the socio-economic framework of small scale farming.

Small farmers have shown a strong resilience in the context of economic transformations and various economic shocks. However, they are faced with evolving forces of change in coming decades, including much more integrated and quality-focused agricultural value chains; more complex technological and institutional choices in production, processing and markets. Policies must take into account that farm households are not only passive absorbers of change, but are, in fact, important contributors to development. It may help structural change that a distinction between “rural” and “urban” is getting increasingly

[1] An earlier version was presented by Joachim von Braun as a keynote at the 8th International Conference of the Asian Society of Agricultural Economists, Held at BRAC Center for Development, Savar, Bangladesh, 15-17 October 2014

blurred, especially in densely populated regions of Asia, because infrastructure and services (ICT) are connecting even marginalized areas a lot more intricately.

Small farmers' roles will probably transform fast in the next generation. The purpose of this paper is to identify basic forces of change in the small farm economy, policies that may support productive and socially acceptable transformations, and research to generate useful insights for the guidance of transformation of small farm economies.

1.1 Defining small farms more comprehensively

S*mall farms* are highly heterogeneous and diverse. Small farmers exhibit specific characteristics and play multifunctional "roles" in different regions of the world, and these roles vary in significance in different stages of economic development. Most of the literature defines small farms based on the size of their land or livestock holdings (Eastwood et al. 2010), a usual but arbitrary cut-off size being less than 2 ha (World Bank 2003).

In this regard, land quality and access to resources, such as water, are also key differentiators of small farms. It is important to capture these institutional and technical characteristics in the definition of a *small farm. B*eing small is not only about the land or herd size, but also about varied access to markets and natural resources and the degree of commercialization (von Braun 2005). Given the important role of small farms in reducing rural poverty, the definition of small farms ideally should be asset and income-based (ibid.), not just area based.

Actually a whole dashboard of concepts and related measurable criteria should be applied to identify size, relevance and potentials of the small farm economy. Table 1 lists such a dashboard of five sets of concepts (land size, employment, income, total economic value, societal role). The agricultural economics literature is rich in studies in all these five concepts and to some extent in their inter-linkages. A general international statistical basis, however, exists only for the land-based accounting of "small farms" and even that is quite deficient (Lowder et al. 2014). The definition of farm class sizes for which data are collected is often divergent among countries, making their cross-country comparisons challenging (FAO 2010).

Moreover, the discussion of small farms is dominated by crop production and the inverse productivity relationship. Whereas multifunctional roles of these small farmers in the developing countries, and their subsequent positive or negative impacts on land, labor, input and output markets, and associated value webs, also need to be included into analyses in more comprehensive ways. Furthermore, small farms also include small pastoralists, who are rarely taken into consideration in most of the small farms literature, not much attention is paid to small scale horticulturalists and aquaculturalists, either. Nevertheless, while many developing countries have built up improved information bases on their small farm sectors;

inter-country comparisons are hardly possible based on the outlined comprehensive dashboard.

Table 1. Defining small farms: concepts and criteria

Concepts	Measurements	Strengths	Deficiencies
1. Land holding (or herd) size	Size in hectares cultivated Number of livestock	Simple accounting of physical characteristics; Important for agrarian societies	Lack of economic valuation of farm enterprise (quality of land, location to markets etc.); ownership issues neglected;
2. Employment	Labor in small farms	Important for economy-wide considerations and for livelihoods	Returns to labor (especially marginal returns) undefined; economics of multiple job-holdings missing
3. Income	Annual production and net returns	Integrates with GDP shares; identifies growth and innovation performance; a basis for poverty identification in the small farm economy	Highly variable; pricing own consumption of farm products; externalities not captured (ecosystem services);
4. Total economic value (TEV)	Comprehensive capital stock (assets) account	Identification of wealth; credit worthiness; important for economy-wide considerations beyond GDP	Difficulties to value land and human capital (skills); value of inter-farm collective action (as a form of social capital)
5. Societal role	Small-farm communities; villages; local services	Shows collective action (potentials); governance and fiscal settings; public goods investments	Lacks focus on the farm enterprises;

Source: designed by authors

Taking only the area size of the farm to identify whether it is small or big may lead to misguided policy actions. For example, one hectare of irrigated fertile land planted with high value vegetables and fruits and located close to major urban markets could generate much higher total and per hectare income than, say, 20 hectares of rainfed area under subsistence crops in remote areas. The same one hectare of irrigated land may lead to quite diverging incomes depending if it is sustainably managed or is highly degraded (Nkonya et al. 2011). Moreover, what is small or big may have region-specific characteristics. In Brazil, one third of smallholders have on average about 50 ha. Despite their bigger size, they face the same constraints and have very similar characteristics like small family farms in other parts of the world (Berdegué and Fuentealba 2011). On the other hand, there are about 10 mln smallholder farmers in Brazil, who on average operate 10 ha of land, but for whom agriculture is important, but only secondary source of employment, and they do not rely totally on their farm production for their livelihoods as those smallholders with 50 ha of land (ibid). It is important to keep in mind how far from a satisfactory economic account a simple land-based small farm definition is. Blanket policies defining small farms only by their land

holdings, without considering the multiple aspects of small farm economies, might lead to sub-optimal allocation of resources and to lost development opportunities. Of greatest relevance for development would be the capturing of development contributions by the small farm economy, i.e. innovation potentials, entrepreneurial power, social capital, and social roles that could be mobilized.

Before looking further into structures and change, an implication of the more comprehensive approach of taking account of the economic dimensions of small farms suggests that they are not only very large in numbers, but also bigger in relevance for economic development than generally perceived by policy.

1.2 Theoretical Determinants of "Smallness" of Farms

Smallness of farms is largely endogenous. The fundamental insights of Tschajanov (1923) based on empirical analyses of the relationships between labor use and farm size in Russia around the beginning of the 20th century emphasized that the small farm (including household plots for home production) should not be viewed as just a short-term transition phenomenon. It is an economic reality and it directly depends on the household utility function, and on the underlying economic conditions in product and labor markets as well as social system risks. The factors that advantage and disadvantage small farms compared to large farms have been debated by economists for years, and there are long-standing debates on the viability and the role of small farms in economic development (Schultz 1964; von Braun and Kennedy 1994; Hazell et al. 2010). The seminal research of Schultz (1964) on the efficiency of small and poor farmers brought to an end misleading debates, equating small with inefficient.

Viability concepts need to be carefully assessed in relation to small farms. Economic viability in general means that an operation – be it a project, a firm or farm, or a country's economy - is economically sustainable. In family farming, it means the ability and capacity of a farm to 'make a living' over the long run. Given the relevance of multiple job holdings on small farms, defining viability just on a basis of the farm component of the households' total economy is insufficient, as farm production, labor and capital allocation are optimized in an integrated inseparable fashion in many instances (Singh et al. 1986). Furthermore, defining small farm viability from an economy-wide perspective would need to be based on considerations of total economic value (TEV) and productivity (innovation) potentials. The "people potentials" in the small farm sector, such as entrepreneurship and expanding human capital, may be much more relevant for growth and development in the developing countries, than just the economics of land connected to the small farm economy. Land consolidation or fragmentation policies need to be formulated not just on the basis of crop productivity differentials between farms of various sizes, but taking into account the

diversity of mutually interconnected factors outlined above, also considering the linkages and feedback effects with non-farm sectors.

The concept of *returns of scale* has been used to probe many of the theories of optimal farm size (Chavas, 2001). Empirical studies in the 1970s in India found an inverse relationship between farm scale and productivity, with small farms being more technically efficient than large farms (Yotopoulos and Lau, 1973; Berry and Cline 1979). Hired labor may be the main reason for the lower land productivity of larger farms (Binswanger and Rosenzweig, 1986). Family workers are more efficient than hired workers because family members receive a share of the profit and thus pay greater attention to quality of work than hired labor, and family members require no hiring or search costs, and each family member assumes a share of the risk. However, there are tendencies of (self-) exploitation of labor in family farming, especially in relation to child labor (ILO, 2006) and low remuneration of women's work. For example, Musafiri (2015), using a long-term panel data on Rwanda (two waves: in 1986 and 2012), finds that farm sizes are negatively associated with input use intensity (both labor and fertilizers) and per hectare net farm incomes. Ali and Deininger (2015), also in Rwanda, find that smaller farms enjoy higher profit per hectare when family labor is valued at shadow wages; however, this relationship disappears when the family labor is valued at market wages. Other factors explaining the inverse relationship were suggested to be measurement errors in self-reported land area, systematic soil quality differences between small and large farms, more than optimal use of inputs, especially of family labor, by small farms due to labor market imperfections (Bhalla and Roy 1988, Holden and Otsuka 2014, Ali and Deininger 2015). Several studies accounting for land quality differences, measurement errors in reported land sizes and potential omitted variables, however, still found the existence of the inverse relationship in various settings (Barret et al. 2010, Larson et al. 2014).

In many cases, the small farm might be the optimum size because scale economies that arise from using inseparable inputs (like machinery) are offset by the scale diseconomies that arise from using hired labor (Hayami, 1996). On the other hand, large farms enjoy a credit cost advantage while small family farms enjoy a labor cost advantage. Additionally, the optimal farm size will be influenced by the capacity of small versus large farm communities to engage in political lobbying and rent seeking.

Ultimately, the optimal farm size will be the one under which labor productivity of the agricultural sector approaches that of the non-agricultural sector, given the same quality of labor. Masters et al. (2013) observe that until non-farm sector expands and is able to absorb more and more of rural population, the farm sizes may continue to decline; Asia, with rapidly growing non-farm sector, may start experiencing an enlargement of farm sizes, whereas in Africa the farm sizes may continue to decline for some time (ibid.) However, even with expanding non-farm sector, transitions to larger-scale farming can take a long time due to institutional rigidities, transformation risks, and policies. A simple calculation highlights this: under an assumption of farm closure rates of five percent per annum (be it

through sales or renting out) it would take 45 years to move from an average of one-hectare farms to an average of ten-hectare farms. Europe has only managed that process with half such an exit rate. In brief, small farms will be there for many years to come. Radically accelerated and enforced change in farm size usually entails suffering and is economically inefficient. Therefore, a successful and endogenous transition to larger scale farming would require wide-reaching institutional transformations and not simply a government (re-) allocation of land to large scale farms by decree (Collier and Dercon 2014).

In this evolving context, small farms require focused development attention for several reasons. Firstly, they play key roles in broader economic transformations. Considering that small farms are home to large shares of populations in developing countries, the successes of economic transformations need to take the economy-wide roles of small farms into account. Secondly, the protection of natural resources and their sustainable use by small farms is becoming a critical aspect of farm productivity. For example, land degradation is found to affect more than 3 billion people around the world, the majority of whom small farmers and pastoralists in developing countries (Le et al. 2014), and has serious economic consequences for them (Nkonya et al. 2011). Thirdly, globalization and changes in markets offer new opportunities and competitive threats for small farms. These opportunities and threats need to be evaluated with a view to enable small farmers to successfully integrate into new value webs or at least partly exit agriculture to nonfarm activities. Fourthly, small farms play a key role in reducing poverty. Most of the poor in the world reside in small farms (von Braun et al. 2009), so what happens in small farms will be decisive in actions against poverty. Among the population, those most affected by food insecurity are the smallholder farmers, because of income and direct production linkages. Therefore, if these farmers were better off, hunger and the sticky problem of child malnutrition would diminish.

1.3 Patterns and change of small farms

The world currently contains about 570 million farms, if we include small household agricultural production (Lowder et al. 2014). Table 2 depicts their estimated size distribution (not controlled for land quality). Approximately 85 percent of the world's farms are smaller than 2 hectares. About half of small farms are in low or lower middle income countries (Lowder et al. 2014). Most of the farms, including small farms are located in Asia, particularly China and India (Figure 1). It should be stressed that land quality differs widely among these small holdings.

Table 2. An approximation of world farm size distribution by regions

Region	Land size classes					
	< 1 ha	1-10 ha	10-50 ha	50-100 ha	100-500 ha	>500 ha
Asia	78%	19%	1%	-	-	-
Sub-Saharan Africa	62%	37%	1%	-	-	-
Middle East and North Africa	60%	33%	7%	-	-	-
Latin America and Caribbean	17%	47%	23%	6%	-	-
Europe	-	77%	15%	3%	3%	-
North America and Australia	-	19%	32%	16%	24%	9%

Source: data from Lowder et al. (2014), FAO datasets

Note: Blank cells mean the number of farms under this land size class is less than 0.1% of the total.

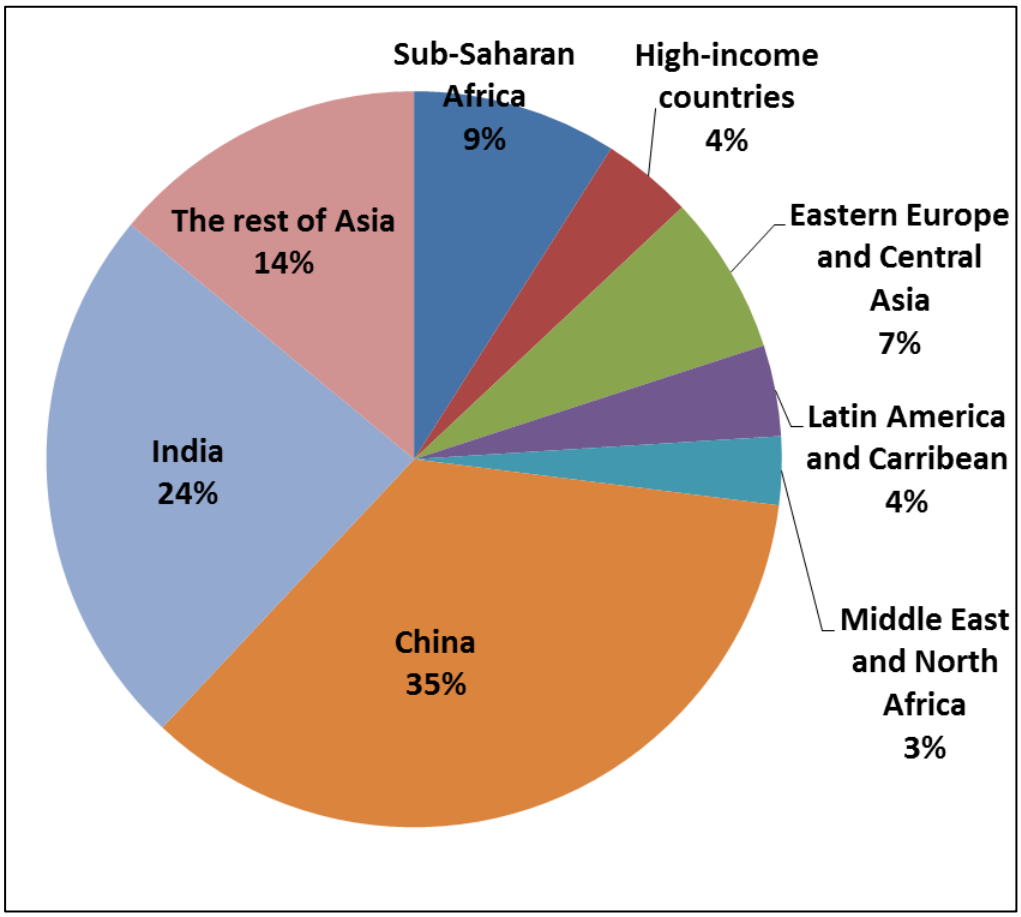

Figure 1. The distribution of the total number of farm holdings by region.

Source: compiled from data from Lowder et al. 2014, FAO datasets

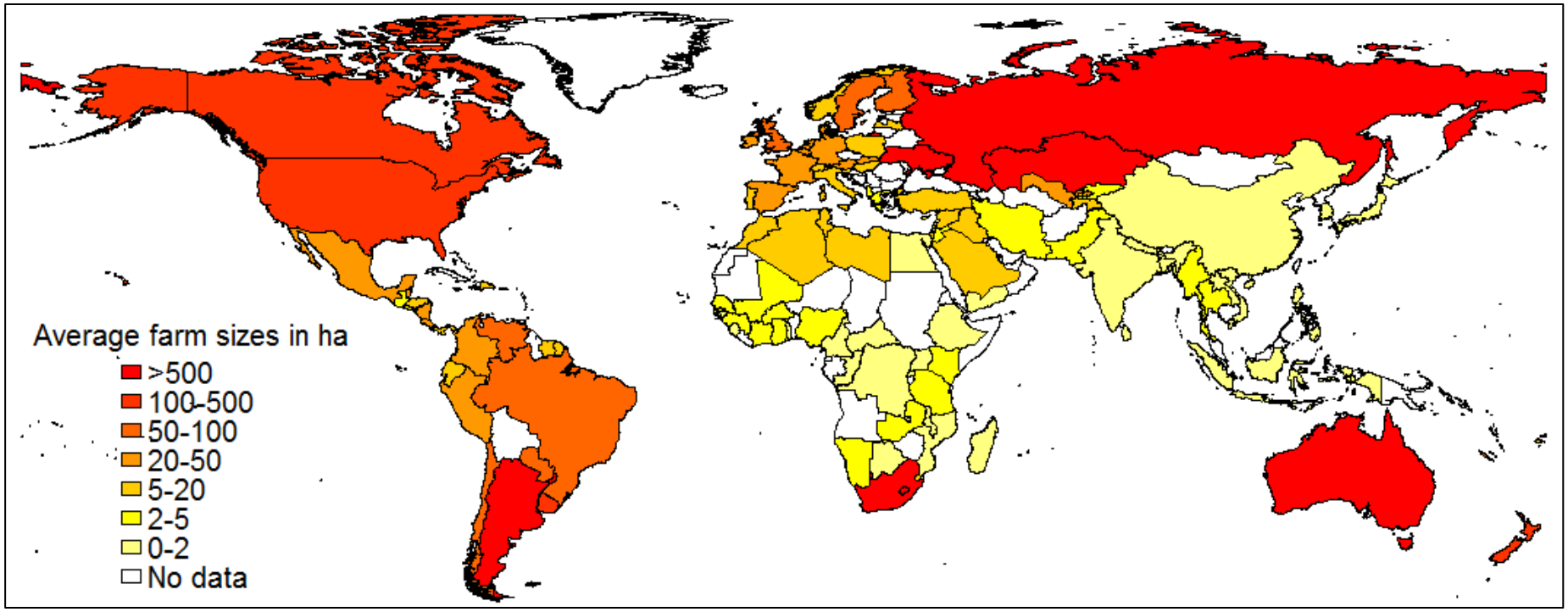

Figure 2. Average farm sizes across the world.

Source: compiled from various sources. Note: the data from latest available censuses are used. In some cases, more up to date numbers are included from other statistical and research publications.

Small farms dominate in most of Asia and Sub-Saharan Africa, where average farm sizes are often less than 2 ha (Figure 2). However, less than 2 hectares category is also quite heterogeneous across the countries, with great variations between less than 0.5 ha up to 2 ha. Farm sizes bigger than 2 ha make up a relatively small share of the number of farms in many developing countries (Table 3).

Table 3. Farms size class patterns in selected countries around the world (ownership)

Countries	Census Year	Total No. of farms in thousands	Farm size class							
			< 1 ha	1-2 ha	2-5 ha	5-10 ha	10-20 ha	20-50 ha	50-100 ha	> 100 ha
Bangladesh	2008	28 696	74%	17%	7%	1%	.	.	.	.
Brazil	1996	4 838	11%	10%	16%	13%	14%	17%	8%	11%
China	1997	193 446	93%	5%	2%	0%	0.2%	.	.	.
Egypt	2000	4 542	87%	8%	4%	1%	.	.	.	.
Ethiopia	2002	10 758	63%	24%	12%	1%	.	.	.	.
India	2010	138 348	67%	18%	12%	2%	1%	0.1%	.	.
Indonesia	2003	24 869	75%	14%	11%	.	.	.	.	.
Kazakhstan*	2007	203	23%			13%	11%	11%	8%	30%
Kenya	1994	2 750	81%		17%		1%	0.7%	.	.
Kyrgyzstan	2002	1 131	85%	7%	5%	2%	1%	0.1%	0.1%	0.1%
Nigeria	2004	46 000	56%	24%	11%	6%	3%	.	.	.
Pakistan	2000	6 620	36%	22%	28%	9%	4%	1%	0.3%	.
Philippines	2002	4 823	40%	28%	24%	6%	2%	0.4%	.	.
Russia*	2006	423		21%		16%	11%	12%	7%	33%
Senegal	1999	437	21%	17%	33%	21%	8%	1%	.	.
Thailand	1993	5 647	20%	23%	37%	16%	4%	1%	0.1%	.
Uganda	1991	1 704	49%	24%	17%	6%	4%	.	.	.
USA	2002	2 128	.	.	11%	10%	14%	22%	16%	28%

Source: Data compiled mostly from Lowder et al. (2014) and other sources. Notes: *The numbers for Kazakhstan and Russia exclude household kitchen plots (2.7 mln and 17 mln, respectively). If included less than 1 ha category will make up more than 95% of the total number in both cases. Blanks means the share is less than 0.1% of the total number.

The long-term data show that average farm sizes are decreasing in most (but not all) lower income countries and increasing in industrialized and some emerging economies (Table 4). However, in those countries which are experiencing farm size decreases, the rate of decrease has decelerated. Whereas, some developing countries, notably China and Vietnam started experiencing a slight and recent increasing trend in their average farm sizes.

Table 4. Average size of agricultural holding in selected countries, by decade

Country	Average size of agricultural holding, by decade					Trend
	1960	1970	1980	1990	2000	
Bangladesh	1.4		1.3		0.3	Decrease
Egypt	1.6		1.0	0.9	0.8	Decrease
India	2.7	2.3	2	1.6	1.3	decrease
Indonesia	1.2	1.1	1.1	0.9	0.8	decrease
Kenya	12	4	2.5	2.5	2.4	decrease
Pakistan	3.5	5.3	4.7	3.8	3.1	decrease
Philippines	3.6	3.6	2.9	2.2	2	decrease
Sri Lanka	1.6	1.2	1.1		0.5	decrease
Brazil	75	60	71	65	73	stable
Ethiopia			1.4	0.8	1	stable
Japan	1.2	1	1	1.2	1.2	stable
Canada	145	188	207	242	273	increase
China			0.6	0.4	0.7	increase
France	19	22	27	31	45	increase
Germany	12	14	17	30	40	increase
South Africa	817	1094	667	1260	1400	increase
Tanzania		1.3		2.8	2.4	increase
USA	123	158	168	187	178	increase
Viet Nam				0.5	0.7	increase

Source: Lowder et al. (2014), Note: blank means no data were available.

2. Farm size and productivity: an inverse relationship?

One of the major foci of literature on small farms concerns the relationship between *farm size and crop yields*. There is a substantial body of research indicating to an inverse relationship between farm size and crop yields (Tschajanov 1923, Sen 1966, Larson et al. 2014, Zhang 2015, among many), specifically when agriculture is labor-intensive with little mechanization (Ali and Deininger 2015). For example, Ali and Deininger (2015) find a strong negative relationship between farm size and crop yields in Rwanda. Labor market imperfections are indicated to be the major reason for this inverse relationship, due to which small farms apply excessive amounts of family labor than under optimum conditions (ibid.). Zhang (2015) finds that farm sizes are negatively associated with crop yields and on-farm capital investments in China. Larson et al. (2014) also find that maize yields have negative relationship with plot size, due to more intense application of inputs, especially labor, at smaller plots.

On the other hand, as agricultural production gets more capital-intensive, the inverse relationships between farm size and crop yields may fade or even reverse (Foster and Rosenzweig 2011, Ali and Deininger 2015). Chen et al. (2011) find that the inverse relationship disappears in farms in China once the land quality is taken into account. On the other hand, Barret et al. (2010) using data from Madagascar reject that the inverse relationship is explained by soil quality. Ali and Deininger (2015) indicate two factors that might be behind the reversal of the inverse relationship: excessive land fragmentation might have made some farms too small for efficient operation and recent technological advances, including in information and communication technologies, might have made it easier to supervise labor, thus cutting down on the transaction costs of hired labor (ibid.). Yet another strand of studies find the relationship between farm size and crop yields to be U-shaped (Eswaran and Kotwal 1986, Carter and Wiebe 1990, Heltberg 1998, Helfand and Levine 2004). The conclusion may be that the findings on the inverse relationship might have been influenced by the small variations among farm sizes in many countries (where all farms are relatively small), but may emerge at much larger sizes (out of sample for many studies focusing on developing countries).

Several studies found small farms to have higher *land productivity* than bigger farms due to higher incentives and productivity of family labor (Eastwood et al. 2010), especially in Asia where labor is more abundant than land (Hazell et al. 2010). For example, decreasing returns to scale in agricultural production were found in East Java, Indonesia (Llewelyn and Williams 1996), in Pakistan (Heltberg 1998), in Rwanda (Musafiri 2015). However, Fan and Chan-Kang (2005) also indicate that, in certain cases, once the varying degrees of soil fertility and land potential (irrigated vs. rainfed) are taken into account, the diseconomies of scale in land productivity between small and large farms may disappear. Moreover, there are numerous

evidences that small farms could be less efficient in terms of labor productivity (ibid.). Wiggins et al. (2010) conclude that distinct advantages of small farms are present in cases when the main agricultural input is family labor and there is very little use of external inputs, the production is chiefly for home consumption with whatever surpluses sold to small-scale traders.

Macro-level cross-country comparisons in Asia show that average farm sizes are positively associated with agricultural value added per worker (Figure 3). This relationship is even stronger in the countries of Sub-Saharan Africa (Figure 4). The comparison of agricultural growth rates with changes in farm sizes does not show a consistent picture for the Asian countries (Figure 5): The overall trend seems to show that increase in farm size is associated with faster agricultural growth, but this seems heavily influenced by just a few countries (Tajikistan, Uzbekistan, South Korea, Vietnam). The results for SSA countries (Figure 6) are showing little association with farm size changes and the rates of agricultural growth.

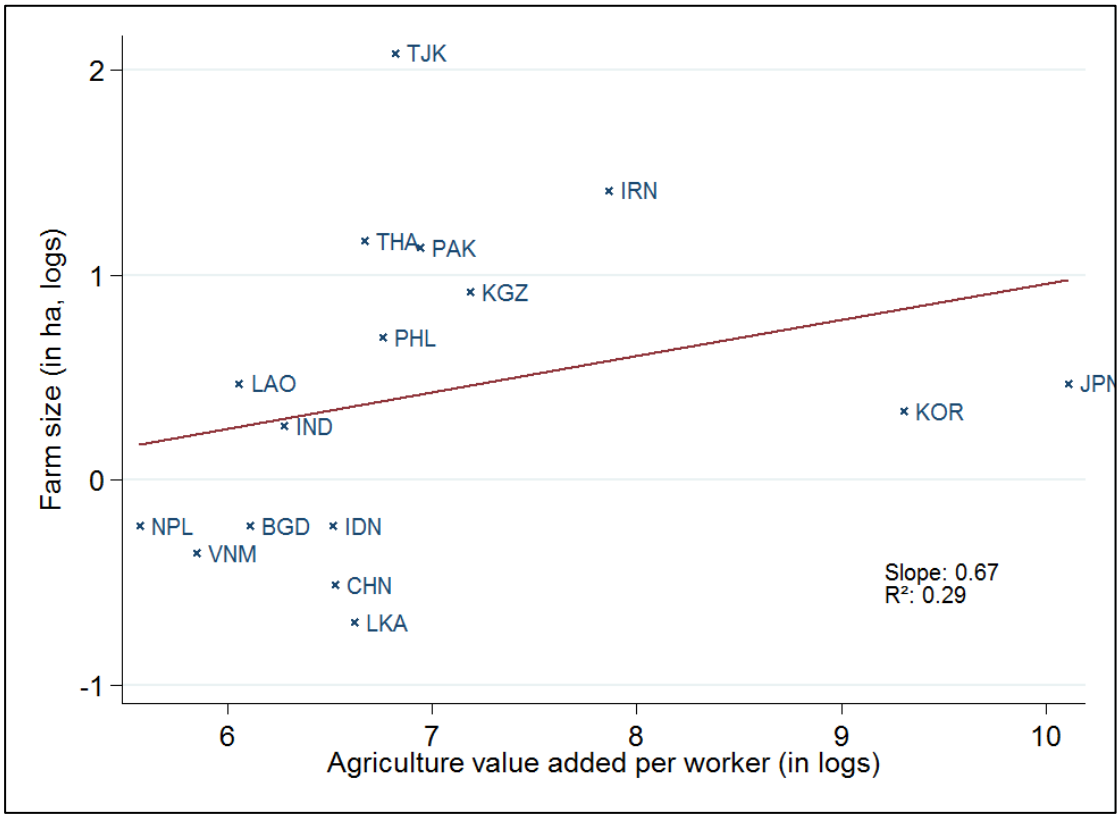

Figure 3. Farm size and agricultural value added per worker in Asia

Sources: Word Development Indicators, World Bank, Lowder et al. (2014), FAO.

Most of the Asian and SSA countries have very small average farm sizes, so passing from, say 0.4 ha to 0.8 ha may not necessarily have any strong qualitative change that may influence agricultural growth rates while passing from, say average 5-10 ha to 20-25 ha may have bigger impacts. This is also in line with the hypothesis of U-shaped relationship between farms size and farm productivity indicated above (Eswaran and Kotwal 1986, Carter and Wiebe 1990, Heltberg 1998, Helfand and Levine 2004).

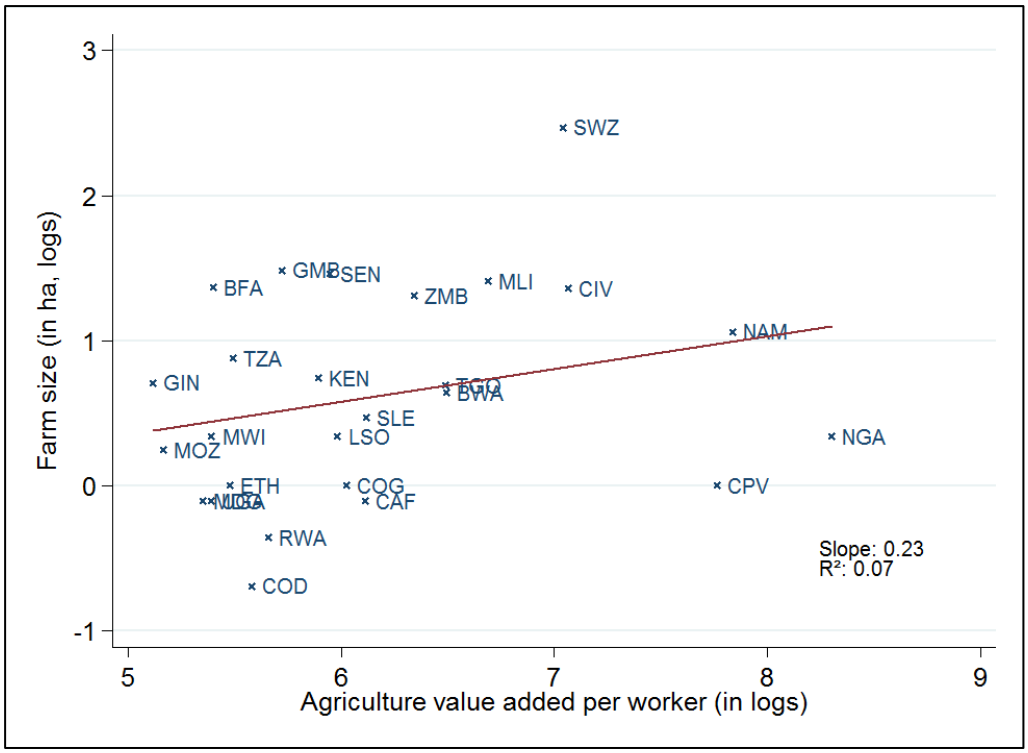

Figure 4. Farm size and agricultural value addred per worker in SSA

Sources: Word Development Indicators, World Bank, Lowder et al. (2014), FAO.

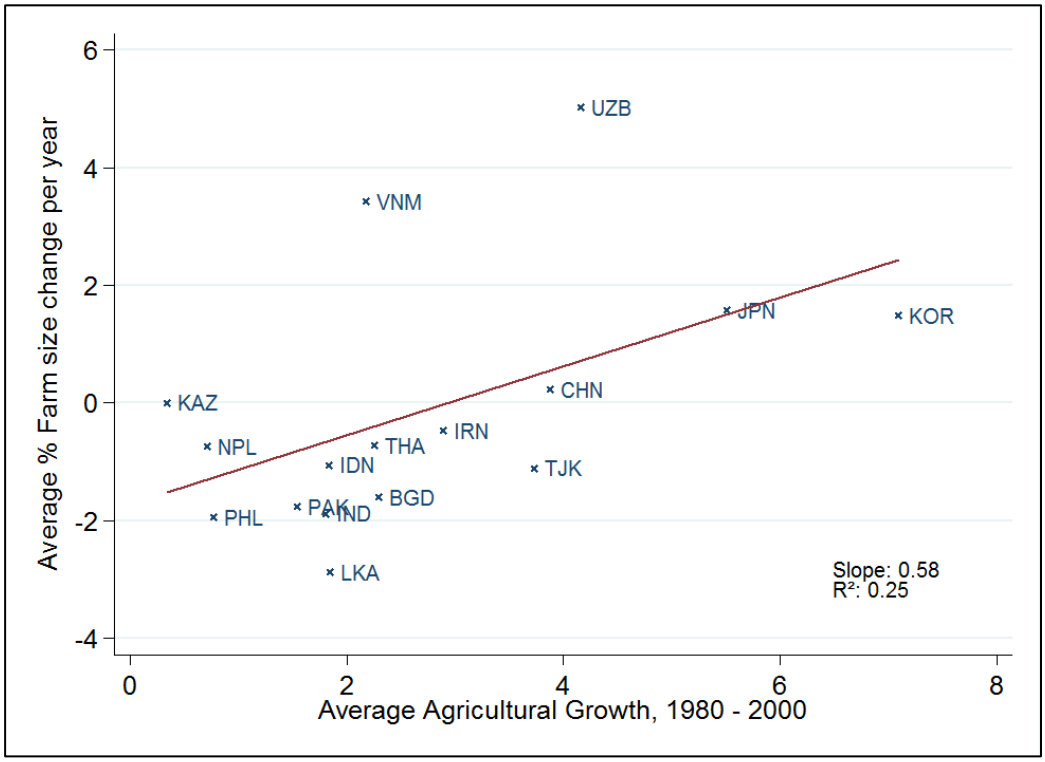

Figure 5. Annual changes in farm size and agricultural growth rates in Asia (on average)

Sources: Word Development Indicators, World Bank, Lowder et al. (2014), FAO.

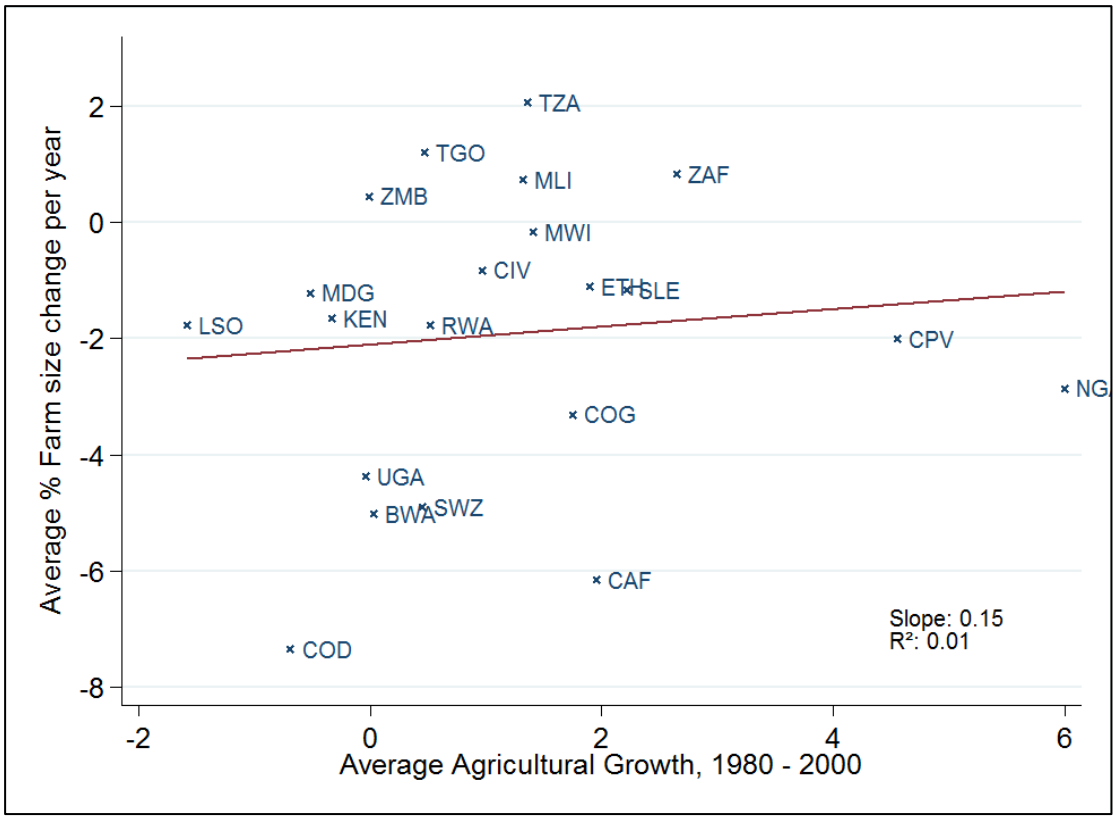

Figure 6. Changes in farm size and average agricultural growth rates in SSA, both in logs

Sources: Word Development Indicators, World Bank, Lowder et al. (2014), FAO.

Many small farms are no longer producing primarily for home consumption, but are integrated, to various degrees, into labor market and agricultural value chains. They also use a variety of external inputs, and are increasingly faced with ever more concentrated supply chains. However, small farms are persisting despite many of these changing factors. Small farm households operate in various markets – labor, land, capital, crops, animal products – and that may give degrees of freedom to risk management. The wider adoption of information and communication technologies (ICTs) can greatly help in access to market information and knowledge by small farmers which is also important for resilience.

There is no longer a clear-cut answer to the question whether small farms perform more productively in what circumstances. Certainly, the performance of small farms is modulated by a variety of accompanying policy, institutional, market and agro-ecological conditions. In view of the rising role of innovation (Total factor productivity, TFP) in agricultural growth (Fuglie and Wang, 2013) we would expect that agricultural grows more and better if accompanied with a strong knowledge society. The comparison of average farm size and of

knowledge economy index[2] shows positive association globally, however, the relationship seems weaker in Asia (Figure 7).

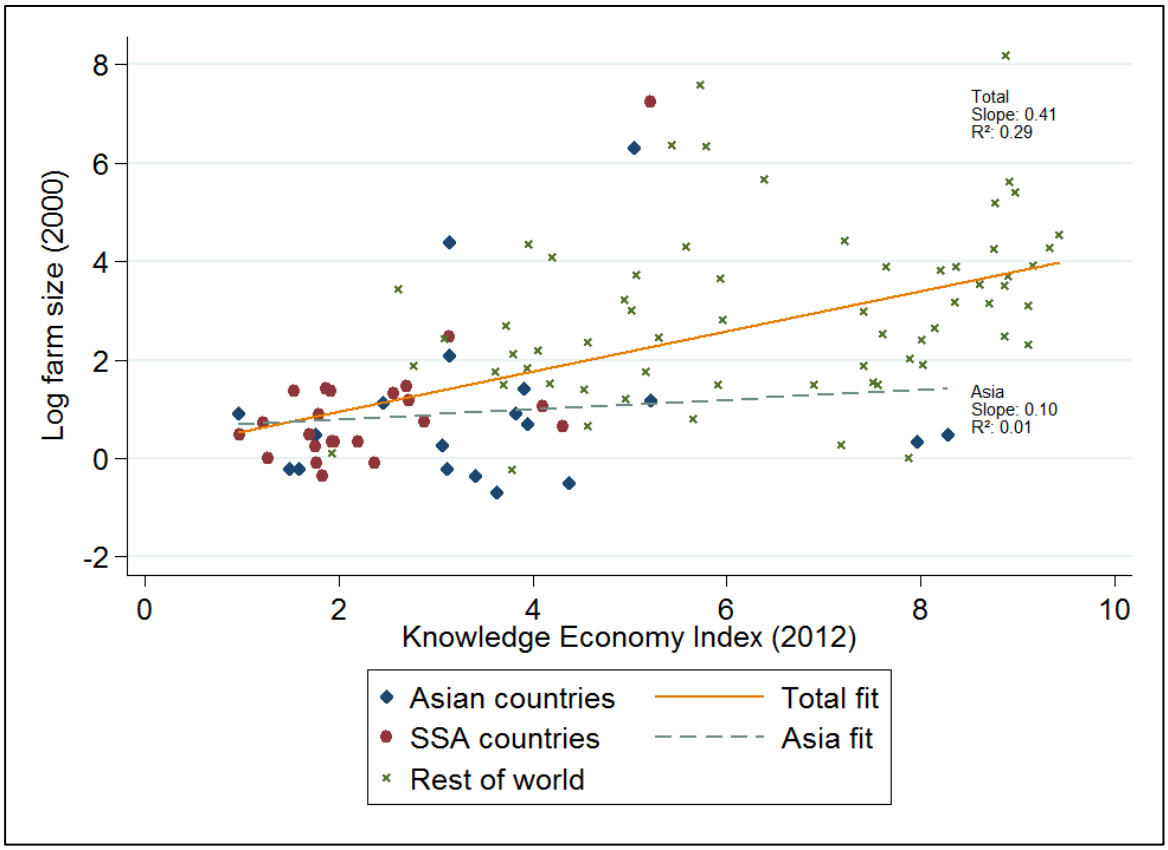

Figure 7. Farm size and Knowledge Economy Index, both in logs

Sources: Lowder et al. (2014), FAO; World Development Bank

[2] The Knowledge Economy Index (KEI) measures a country's ability to generate, adopt and diffuse knowledge. It takes into account whether the environment is conducive for knowledge to be used effectively for economic development.

3. Farm size and sustainability

The relationship with cropland degradation and farm size is shown in Figure 8a and Figure 8b for the Asian and SSA countries, respectively. There seem to be a positive association between farm size and the share of countries cropland degraded in Asia, but not in SSA. It is also true that variation in farm sizes is much bigger in Asia than in SSA (except South Africa), where most of the farms are, in fact, small.

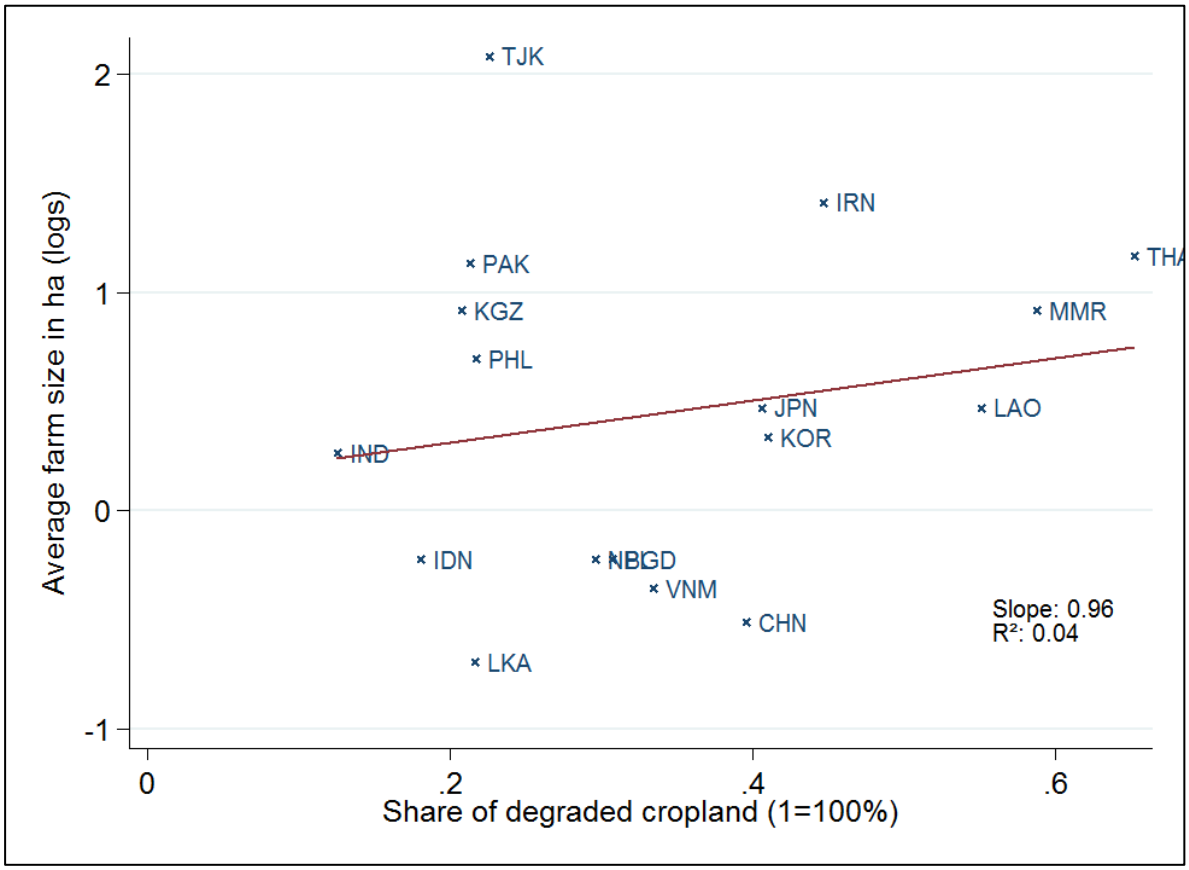

Figure 8a. Farm size and degraded cropland in Asia

Sources: Lowder et al. (2014), FAO; Le et al. (2014)

At the micro-level, Ali and Deininger (2015) also find that soil fertility is higher in smaller plots in Rwanda. It may be that farmers cultivate more fertile lands first, and move to less fertile lands while expanding their operations, or smaller farmers take better care of their land. Byiringiro and Reardon (1996) find that smaller farms apply more soil conservation measures in their plots in Rwanda, which may explain higher soil fertility and subsequent higher yields. On the other hand, Kirui (2015) finds that farmers with larger plot sizes were more likely to adopt sustainable land management practices in Tanzania and Malawi. Similarly, Sow et al. (2015) and Aw-Hassan et al. (2015) find that larger farm sizes were

associated with higher adoption of soil conserving practices in Senegal and Uzbekistan, respectively.

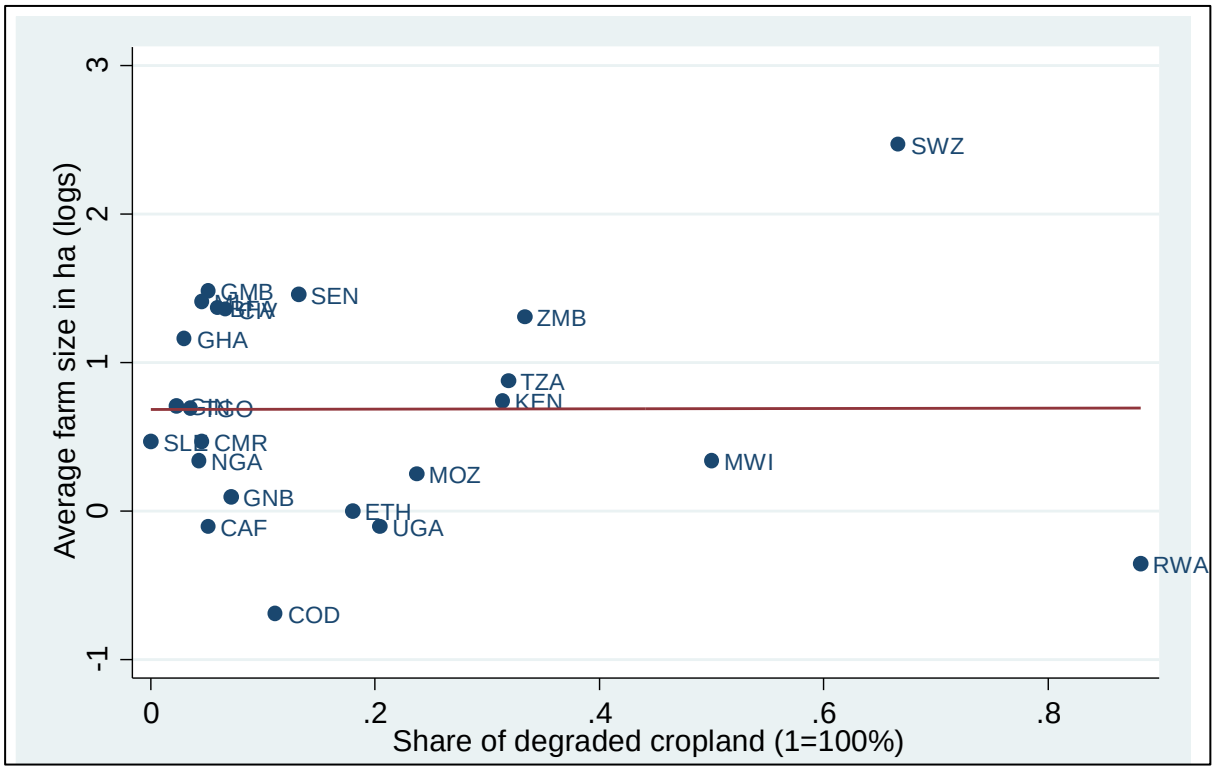

Figure 8b. Farm size and degraded cropland in SSA

Sources: Lowder et al. (2014), FAO; Le et al. (2014)

3.1 Farm size, voice and government accountability

The capacity to demand policy changes relates to the "voice" of small farmers in shaping public policies. Smaller farm sizes across the studied Asian countries are associated with slightly higher Voice and Accountability[3] (Figure 9a). However, the situation seems opposite in SSA, where higher values of voice and government accountability were present for countries with larger farm sizes (Figure 9b). The deeper causes of these patterns warrant further study.

[3] "Capturing perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media" (World Bank Website, World Governance Indicators, http://info.worldbank.org/governance/wgi/index.aspx#faq, accessed on 07.10.205

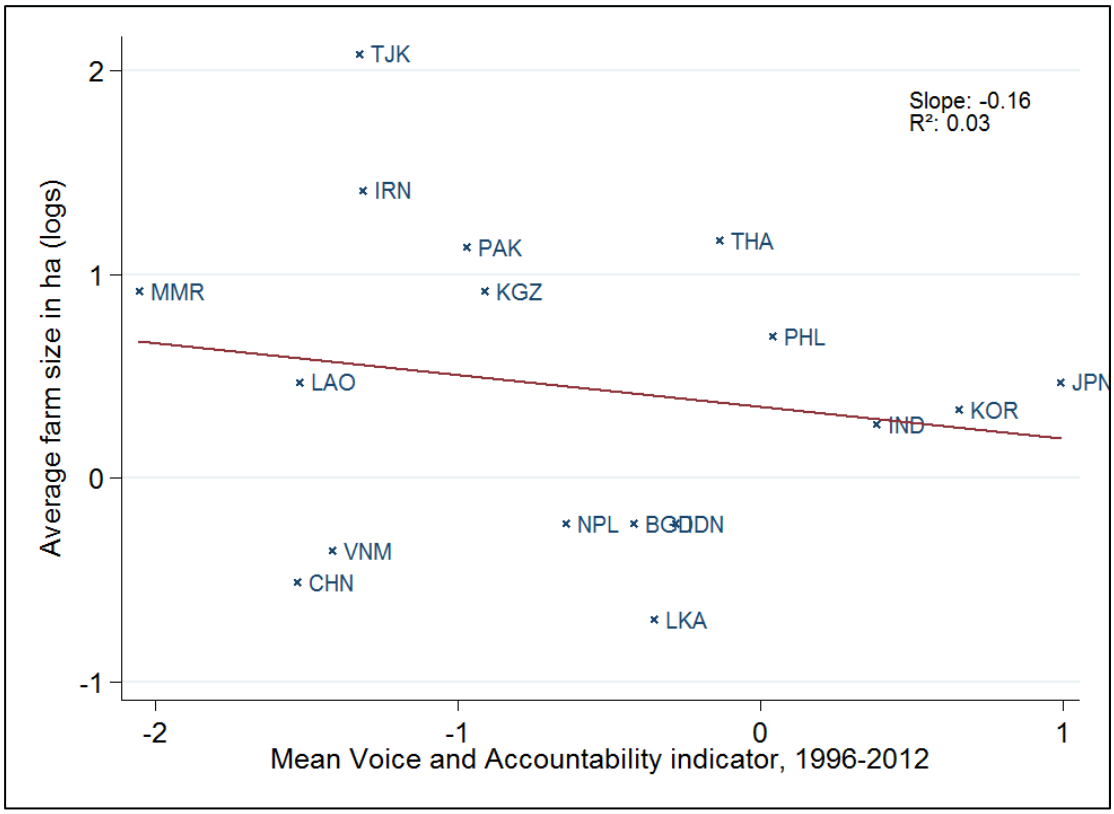

Figure 9a. Farm size and Voice and Accountability Indicator in Asia

Sources: Lowder et al. (2014), FAO; World Bank.

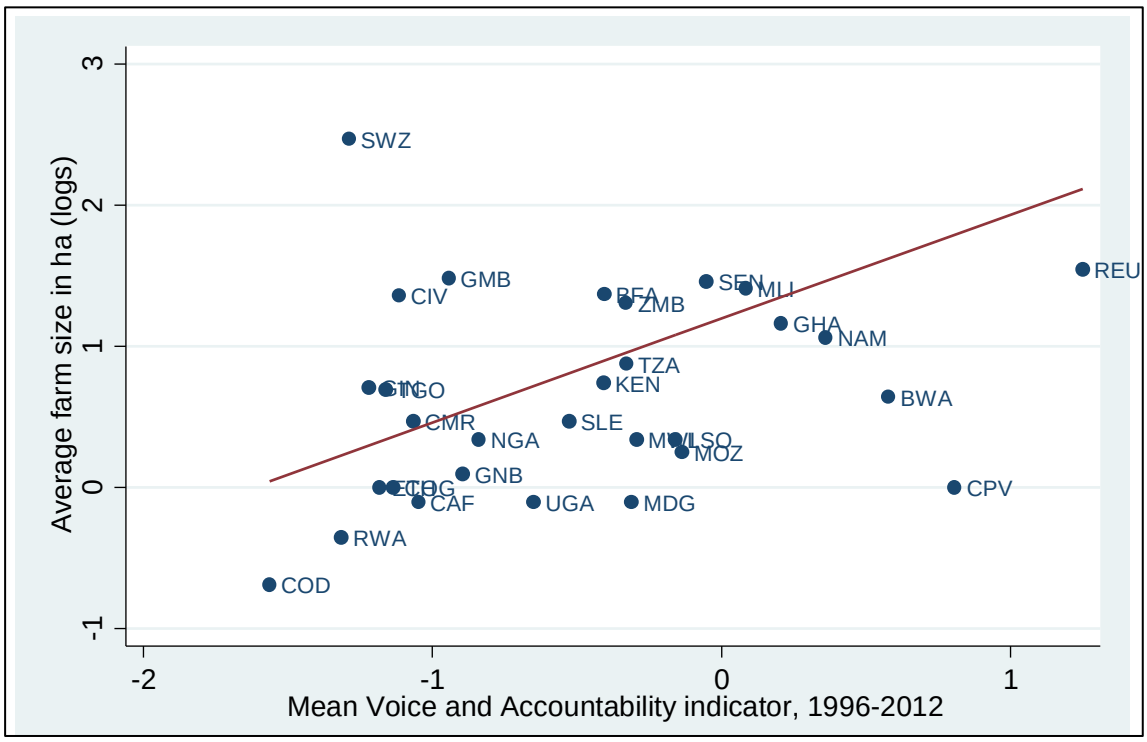

Figure 9b. Farm size and Voice and Accountability Indicator in Asia

Sources: Lowder et al. (2014), FAO; World Bank.

3.2 Transformation of the small farm sector and relations to the rural and urban economies

Driving forces of small farm transformations

The fundamental forces which are driving farm change can be broadly clustered into those that are exogenous and those that are endogenous to farming. Exogenous forces drive patterns and changes by location and geography, ecology and nature, and infrastructure. The latter is largely determined by the production potentials opening up through infrastructure improvements and rural urban linkages. Endogenous forces are driving (and constraining) change due to current and inherited agrarian and political institutions. Technological and institutional innovations are partly endogenous and exogenous. For example, despite similarly small farm sizes in China, Japan, India, Thailand and South Korea, agricultural growth rates have varied significantly between these countries and over time, pointing at the role of the policy and institutional environment in shaping the level of viability of small farms.

There are six mega trends shaping (small) farm economics. Each of these trends plays a role in shaping the scenarios for the futures of farms:

1. Demographics of farm populations, urbanization and labor

Currently, the world population is slightly more than 7 billion people, and is estimated to increase by a third over the next 40 years. As the world population increases, the farm population will increase too, but at reduced numbers and with increased aging. As the world is becoming more and more urbanized, the share of the total population living on farms will decrease. A mega-driver of change is the change in global employment. The total number of employed people will increase from 3 billion to 3.5 billion people by 2020. The number of those employed in farming will decrease by 0.3 billion (von Braun 2011). This means an increase of employment outside agriculture by 0.8 billion. However, all of those will not be employed in urban areas. At least half of them will find their employment in the industry and services sectors in rural areas, namely in the small rural centers and towns.

2. Change in demand for food and agricultural non-food products

The world population is estimated to reach about 9 billion by 2050 and these people will want to eat like 12 billion compared to today, because they will be richer and more urbanized. The volume and patterns of consumption will change. The western middle-income society is the trendsetter. People will eat more packaged food, more diverse and more fast food. The consumption of animal products, such as milk, eggs and meat (especially

poultry) will increase. Some of these products in high demand have declining returns to scale, such as vegetables, and are promising candidates for small farm growth; others have increasing returns to scale, such as poultry, and are of diminishing opportunity for small holders.

3. Prices of outputs and resources

Agricultural prices determine viability of small farms to a significant extent. These prices have increased and have become more volatile. Volatile prices are adverse for small farm growth as they increase risks (and small farms have low risk coping capacity) and impair investments (von Braun et al. 2014). Financial markets and food markets have started to become linked, and especially more so in the last five years. Recall the food price spikes of 2008 as well as the wheat and maize price increase in 2010. The consequences of these trends towards higher prices and their volatility influence the costs of natural resources. As food prices increase, the pricing of natural resources is affected with prices for land and water rising as a consequence of expected higher output prices. There is now an active international demand for land. Currently, most such land acquisitions take place in Africa, although it occurs also in parts of Asia, such as in Cambodia and Pakistan. We now observe an internationalization of land markets and that impacts on the viability of small farms especially when property rights are insecure. Local government also plays a role in this in Asian nations (i.e. China and India) when land becomes a source of indirect fiscal enrichments.

4. Infrastructure, ICT, and rural services

The mega-trend of increasing access to information and communications technology cannot be emphasized enough. It gives a boost to rural areas, and it will change the whole landscape of infrastructure. Not long ago, this trend only entailed cell phones, which are soon in everyone's possession all over the world. Currently, there is a fast expansion in smart phones with internet access. This development changes the environment also for small farms. It will facilitate access to rural services and revise the idea of a region being landlocked. This will certainly change the future of farms and the landscape of agricultural productivity.

5. Agricultural science and technology

Investments in science will have a fundamental impact on what level of food prices the next generation will have to pay, and what extent of hunger it will experience. There is an urgent need for increased agricultural research investments and enhanced natural resources

management and market efficiency together with effective policies. The major technological changes in the next decades will probably not be in the grain sector, but in the meat and dairy and horticulture sectors and in non-food bioeconomy related diversification.

6. Changing political economy of food and farming

As the land resources farmers are controlling will become more valuable, these farmers are going to be more powerful than they are today, as long as land property rights are protected. Farmers' organizations may become stronger and consequently more capable to represent the farming communities.

4. Small farms and poverty reduction

Small farms are homes to the majority of the poor in the world. For this reason, improving the productivity and incomes of small farmers can help significantly in reducing poverty. There are several ways how this can be achieved, and they have been researched since long. Firstly, commercialization and technological innovations among small farmers can help reduce poverty (von Braun and Kennedy 1994, Binswanger and von Braun 1991). Diversification from solely staple crop production, to the production of commercially high value crops is another avenue for reducing poverty among small farmers. Joshi et al. (2006) find that in Uttar Pradesh, India, diversification to vegetable production increases profits among small farmers. Klasen et al. (2013) find that those farmers in Indonesia who shifted from coffee to cocoa production following the Asian economic crisis in 1997-98 may have increased their incomes by 14%. Diversification typically may also involve specialization at the farm level, with growing varieties of production and processing at the regional level (von Braun 2005). However, not all small farms could immediately benefit from liberalization and higher degrees of commercialization. Therefore, the timing, speed and extent of reforms need to be appropriately fine-tuned to avoid exposing small farms to additional market risks they are unable to cope with (von Braun 2005). Leaving to markets to sort this out by themselves may not work due to market and institutional imperfections in many developing countries, especially when stakes are high, as the livelihoods of millions of small farming households depend on the success of these reforms.

Obviously, not all small farms are to be economically viable, especially in the context of increasing opportunity costs of labor due to higher wage growth rates in nonfarm sectors. Already many small farmers are engaged in rural multiple income generating activities. Presently, about 50% of earnings of rural households in Asia come from nonfarm sector (Haggblade et al. 2010). Brookfield (2008) suggests that pluri-activity is a strategy to increase incomes due to lower labor requirements in the farm, and not a mere survival strategy for small farmers. In any case, improving access to nonfarm jobs is another critical aspect of poverty reduction among small farmers. There may be two different mechanisms leading to growth of rural nonfarm activities, namely, the push and pull scenarios (ibid). In the case of pull scenario, dynamic agricultural development stimulates the growth of nonfarm sector – the way it happened in many Asian economies (Headey et al. 2010), whereas in the push scenario, stagnant agriculture and falling productivity forces rural households to seek whatever incomes and livelihoods outside agriculture – a process which was suggested to be more prevalent in many African countries (ibid.). Thus, push scenario may not necessarily lead to an escape from poverty for many rural households (von Braun 2005). In both cases, there is a need for creating conditions for orderly outmigration of labor from farm sector to nonfarm and even from rural areas to urban areas (Headey et al. 2010), especially in Asia, given the magnitudes of these population movements.

4.1 Small farms and land rights

The Human Rights Council Advisory Committee of the UN General Assembly indicates that family farms are most vulnerable to the violation of their rights, including their land rights (Human Rights Council 2012). Lack of clearly defined land rights could lead to social conflicts, social marginalization and exclusion (von Braun and Gatzweiler 2013). Moreover, policies to improve land rights should also give prominence to the land rights of women. In many Asian settings, existing tenure systems are gender-biased favoring males in the farming households (Agarwal 1994). Research shows that secure land tenure provides stronger incentives for adopting new improved technologies, and making longer-term investments into sustainable land management practices (cf. Nkonya et al. 2011 for a review). Promotion of the "Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security" is an important step forward, but needs to be institutionalized and implemented at the national levels. Moreover, the envisaged outcome behind land reforms targeted at securing land rights need to be poverty reduction and enhancing the food security among the rural poor (Lipton 2009), preventing potential "elite capture" which may defeat the purpose of securing land rights for smallholders.

4.2 Small farms and evolving value webs

Although agriculture is *driven* by economic and sociological forces, agriculture itself is also *driving* change in the economy and society. Market value webs, increasingly dominated by supermarkets, with controlled quality standards are raising the transaction costs making it difficult for small farms to enter these markets (Reardon et al. 2009). For example, Marschke and Wilkins (2014) find that current certification standards for aquaculture may not be feasible at the small farmers scale in Vietnam. Miyata et al. (2009), on the other hand, cannot find evidence that large-scale buyers prefer not to have contract farming arrangements with small farms in Shandong province in China, though it is acknowledged that all farms in their area of study are small. Crucially, contract farming was found to lead to higher farmer incomes (ibid.). Similarly, Briones (2015) finds that, in fact, the participation in contract farming was negatively related to farm size in the tobacco production in the Philippines, with smaller farms being able to reap more benefits from contract farming. A study on contracting from Indonesia shows that contracts may have increased returns to capital for the seed corn and broiler producers, but not for the seed rice producers (Simmons et. al, 2005).

The challenge is to enable small farmers to successfully integrate and benefit from these new market webs or find non-farm employment (Sharma et al. 2013, McCullough et al. 2010). Market access for small farms could be improved in several ways, such as through collective action and forming producer and marketing associations (Markelova et al. 2009).

Hayami and Kawagoe (1993) show, in the example of western Java and Sumatra in Indonesia, that small farmers can efficiently participate in informal marketing arrangements through making intensive use of their more abundant labor resources and economizing on capital and managerial resources. Collective action and public-private partnership was also shown to enable small farmers in India to access horticultural export markets (Roy and Thorat 2008). Enabling small framers to have bigger access to contract farming could help them in overcoming institutional and infrastructural shortcomings (Joshi et al. 2006, Uttar Pradesh, India).

With the emerging shift into a bioeconomy, a much broader trend than just connecting farmers to supermarkets is in the making (von Braun 2013). Traditionally, agriculture meant farms, forests and fish. In the future, agriculture will entail the whole value chain, including agri-business and retail revolution, also ecosystems services, and linkages to bio-economy, thus: not just one value chain but many joint systems of value chains, with a growing importance of biomass and of quality of bio-based products. Several developing countries have established bioeconomy strategies and need to carefully consider the small farm sector in these strategies.

5. Implications for policy and research

By investing more in farms, and by increasing efficiency of farming, a large part of poverty and malnutrition could be reduced. Small farms play multifunctional roles in development (HLPE 2013). Importantly, public policies need to regard small farms as a part of a broader development solution, and not a problem to solve (da Silva 2013). The year 2014 was declared by the United Nations as the International Year of Family Farming, recognizing the importance of family farms for food security and environmental sustainability. The family farms sector is an integral part of a broader economy; hence, public policies need take into account these integral connections of the small farm sector with the rest of the economy (Table 5). The policy support should be aimed at promoting the dynamism both within the family farm sector itself (Option 1), but also enhance the dynamic interactions and integration of the family farm sector with the rest of the economy (Options 2 and 3). All three options of small farm transformation need public policy attention, not just a small holder growth strategy.

Table 5. Small farmer strategies and policy instruments

Small farm people's strategies	Policy support (main examples)
1. Growth in farming through expansion, commercialization, specialization and diversification.	Technology R&D, market improvement; extension; finance; public services; tenure and property rights improvements; institutional arrangements strengthening farmer cooperation; income support; price stabilization regimes
2. Part-time farming with additional off-farm rural income	Labor market expansion; support for migration; Cooperation; land market liberalization; strengthening rural services
3. Exit farming altogether	Labor market expansion; Land market liberalization; strengthening rural services

Source: designed by authors

The policy support measures mentioned on the right hand side of Table 5 entail costs and require careful evaluation in the respective context, regarding their costs and social returns. The future of small farm families and their food security depend on:

- Technological and institutional innovations facilitating growth with sustainability
- Trade and reduced market volatility
- Migration to non-farm sectors
- Improved rural services for education, nutrition and health policy
- Strengthened property rights and political voice.

Small farmers can play key roles in fostering rural growth. It can no longer be assumed that the millions of small farmers will remain a peacefully suffering community in the future. Information and access to political influence through elections and more decentralized political systems are changing the context. Governments need to recognize and uphold smallholder rights, including the right to food, the right for self-organization, the right to land and gaining equitable access to common pool natural resources (HLPE 2013). Strong farmer organizations are crucial for the articulation of farmers in markets and in policy-making bodies. International and national level support for these organizations, including their rightful formation, is still needed in many countries. Crucially, these rights should be equally enjoyed by both men and women.

National policies must support market opportunities to promote income growth for people in poverty. Transport infrastructure and information technology must connect the vast number of small farmers to the opportunities that globalization offers. Access to agricultural technology remains vital in order to reduce poverty. This includes attention to public investment in agricultural research providing such sustainable technology. Furthermore, to support rural entrepreneurs, governments must not intervene with distorting incentives for market agents. With competitive markets, profit seeking private entrepreneurs in rural areas will use community relationships for cooperation to decrease transaction costs.

Research needs to address a set of major gaps that tend to hinder a pro-poor agricultural transformation process of the small farm economy:

- *Lack of analyses of market functioning, especially in relation to competition in domestic food markets and related implications for small holders.* Desired trade reform effects can be countered not only by state- and local-level government interference but also by private-sector actors. The competitive structures of agricultural markets, food processing industries, and the growing retail industries need continued research attention in the small holder transformation process.

- *Lack of specific information on distributional effects of policy changes impacting on small farm households.* Disaggregated information is needed to make political processes more transparent. Assurances of aggregate national economic gains are not sufficient to facilitate buy in to reforms.

- *Lack of practical guidance for investment in infrastructures of all kinds, incl. ICTs that facilitate small farm growth processes.* In particular, the long-term effects of joint infrastructures' synergies are not well understood.

- Lack of insights into the true value of the hidden growth potentials embedded in the *entrepreneurial capacities of men and women engaged in the diverse small farm enterprises* in Asia. While these growth potentials seem to exist, the conditions to facilitate the

transition of this valuable asset into a vibrant non-farm small business community in the context of small farm change is not well understood.

- *Lack of information on social safety nets and insurance systems that facilitate protection of poor small farm families.* Because traditional family based social safety nets are diminishing, the historic transformation in small farm agriculture must be accompanied by *social policies.*

There will be multiple futures for small farms. Appropriate policies facilitating the small farm transition process need to be adjusted to the specific local and country contexts. These policies should primarily focus on people's income opportunities in the rural economy, where small farmers often hold multiple farm and non-farm jobs, rather than be narrowly concerned with viability of the small scale farm enterprise.

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