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INVESTMENT REQUIREMENTS IN EXTENSION TO ACHIEVE ZERO HUNGER AND ADAPT TO CLIMATE CHANGE

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ABSTRACT

An FAO survey on current investment in agriculture in 94 countries reveals that annual investments in agricultural research and extension often lag far behind the level required to meet the Zero Hunger Objectives for most developing countries. This study reflects on a previous FAO investment report that made the general recommendation to set both research and extension investment targets in developing countries at 1% of agricultural GDP. This study challenges the 1% investment target for extension, given the different conditions in developing countries. In order to define proxies for country-specific extension investment targets, the authors developed an extension investment model (EIM) based on socio-economic macro-indicators (poverty/undernourishment, access to information and population density) and a method to define estimates for cost increases related to climate change. The paper describes briefly the methodology and then outlines the results of the study, which reveals significant differences in average investment requirements in different regions and shows the additional extension costs related to climate change and other areas that currently lack investment. The paper concludes with recommendations and areas for further study.

KEY WORDS: *1% GDP, COUNTRY-SPECIFIC, INVESTMENT TARGET, SOCIO-ECONOMIC MACRO-INDICATORS.*

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INTRODUCTION AND OBJECTIVES

About 1 billion people were undernourished in 2010 (FAOSTAT, 2011) and more than 75% of the poor in developing countries live in rural areas. Increasing food and commodity prices pose a serious challenge to achieving the Millennium Development Goals, in particular that of eradicating extreme poverty and reducing hunger by 2015. Strengthening agricultural research and extension is one of the main priority objectives of international development assistance (FAO, 2003). The FAO Knowledge Exchange, Research and Extension Division provides leadership and guidance towards an integrated approach to the generation, sharing and management of knowledge and information on food, agriculture and the sustainable use of natural resources in response to the knowledge, information, technology and capacity development needs of member countries and the fostering of innovation and learning in research and extension.

The objective of the current study is to update national investment targets on agricultural and rural extension carried out by government agencies, civil society and private enterprises and identify investment gaps using a global investment survey conducted under the Investment Assessment Project (FAO/IAP, 2011, unpublished) to meet Zero Hunger Objectives (FAO, 2006) that also consider climate change adaptation by 2025 in developing countries. Without climate change adaptation strategies, poverty reduction efforts lose their effectiveness in vulnerable countries. Earlier studies defined investment targets as a fixed 1% of AgGDP (Roseboom, 2004) or 2% of AgGDP (World Bank, 1981), based on the investment level of developed countries. Our research argues that the 1% investment target would lead to under-investment in more than 50 low-income countries and the 2% investment target falls short in at least 25 of 94 countries that participated in this study. We provide instead country-specific estimates on extension investment targets derived from a newly developed model for estimating extension investment targets for 84 countries.

MATERIALS, METHOD AND DATA SOURCES

Extension investment requirement is strongly correlated to the number of people to be reached with advisory services, and depends on population density, available information technology, level of poverty and prevalence of under-nutrition. Roseboom (2004) suggested a potential average investment target of 1 extension agent per 1,000 agricultural labourers, an approach that was further developed in this study. Countries with lower per-capita income, higher incidence of poverty and undernourishment, lower level of information access and lower population density need higher investments to meet the extension demands, with a higher number of extension agents relative to the population. Therefore we set an interval for the extension agent ratio from 500 to 2,000 active rural population covered by one extension agent.

Within these intervals, a selected list of parameters were ranked using various macro-indicators related to extension: (1) *poverty* using GNP/capita (measured in current international $), poverty headcount ratio at $2 a day (% of population) and prevalence of undernourishment (% of population); (2) *information access:* radios (per 1,000 people), mobile cellular subscriptions (per 1,000 people) and internet users (per 1,000 people) and (3) *population density* (World Bank and WRI Earthtrend online databases). Once a ranking was established for each parameter, a weighted average of all indicators was calculated from the average rank value on poverty (3 weights), information access (2 weights) and population density (1 weight). The weighted average (A_x) was rescaled in the interval [Min=500, Max=2,000] for the baseline and [Min=500, Max=1,500] for the climate change scenario in order to derive a 'one extension agent per number of active rural population' ratio (B_x), with the formula:

$$B_x = B_{min} + (A_x - A_{min}) \times (B_{max} - B_{min})/(A_{max} - A_{min})$$

A country-specific estimate for the 'required number of extension agents' was derived by dividing 'Active rural population (aged 15–65)' (FAOSTAT) with 'Rural population per number of agent ratio' (B_x). GNI/capita in current US$ (2009) was used to estimate and disaggregate the average cost in intervals around the averages (Roseboom, 2004). The annual investment cost per extension agent was estimated at US$ 4,000 to 6,000 for low-income countries, US$ 6,000 to 9,600 for low-middle income countries and US$ 9,600 to 14,400 for upper-middle income countries. These costs per extension agent included personnel costs, and costs for reform and capacity development, operations and for programmes benefitting smallholder farmers as well as costs for monitoring of the extension system.

Results were triangulated with purchasing power parity inflation of each country on 1999 cost data. 'Total expenditure on extension', i.e. the national investment requirement, is determined by the estimated 'required number of extension agents' and the 'country specific cost per agent' derived from the model. These were compared with data on current levels of investment in extension.

The climate change scenario shows an increased investment requirement due to two main factors: (1) the lowered upper interval (Max=1,500 instead of 2,000) of the agent ratio for the increased need of extension agents, and (2) the countries' vulnerability to climate change. We collected agriculture related climate vulnerability information on countries by selecting agricultural policy related sub-indices from the 'Environmental Vulnerability Index' (EVI) SOPAC/UNEP (2004) study: i) climate change, ii) agriculture and fisheries, iii) renewable water, and iv) desertification (SOPAC, 2004). Each is composed of several climate change vulnerability indicators. We calculated an Agricultural Climate Change Vulnerability Index (ACCVI) from the sub-indices by taking the maximum value of the agriculture related sub-indices in order to identify and focus on the most limiting factors for agriculture (e.g. renewable water, desertification). The same approach was used in Szonyi *et al.* (2010) to identify limiting factors to agriculture from soil, climate and water scarcity and link resource endowment to poverty. The ACCVI was then used as a multiplier to the 'average cost per agent' in the baseline scenario that increased the cost of extension investment by 2–6%, depending on the country specific value.

RESULTS AND DISCUSSION

Countries were sorted by the derived value of the agent ratio (500–2,000) in the baseline scenario. The results for the ranking of parameters on poverty, information access and population density are illustrated in Figure 1. The least developed countries are listed in the first quarter of the *x*-axis with their attributed agent ratio in the interval of 500 to 1,000.

According to the extension investment model, one extension agent covers an average of 711 active rural people in Niger (with a total active rural population of 6.16 million, FAOSTAT, 2010) due to low population density, high poverty and poor information access. For these reasons, investment requirements correspond to 8,665 extension

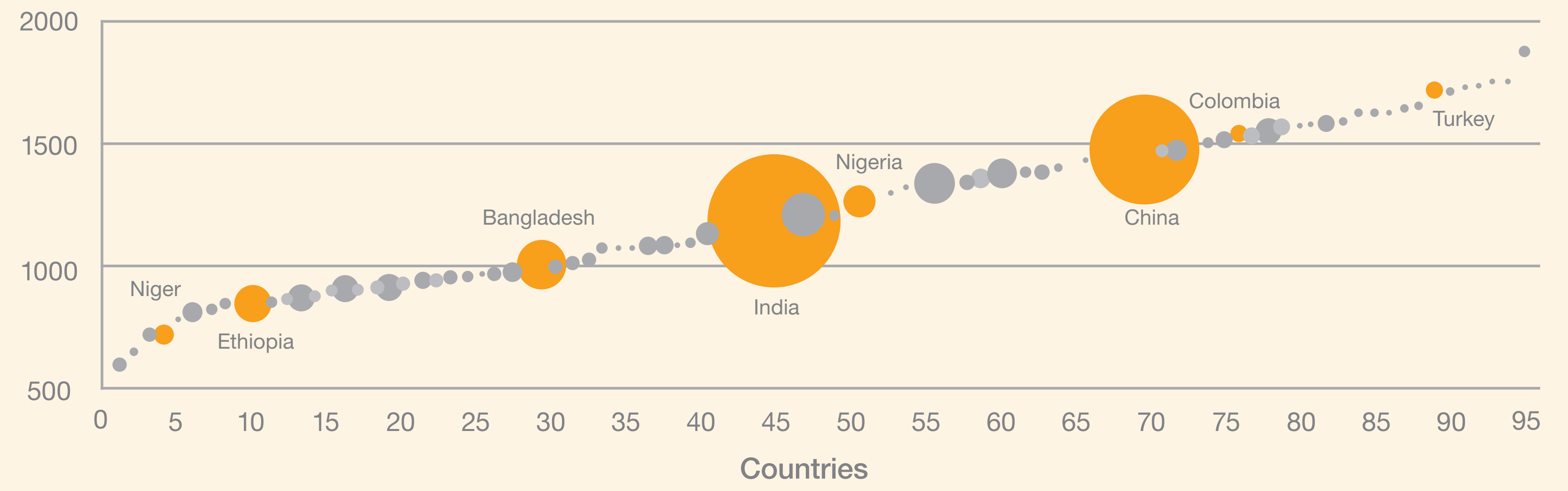

FIGURE 1: NUMBER OF ACTIVE RURAL POPULATION PER EXTENSION AGENT RATIO [500–2000] AND REQUIRED NUMBER OF AGENTS (BUBBLE SIZE) IN THE BASELINE SCENARIO

agents. Nigeria, a neighbouring country to Niger, with high population density, better road infrastructure, higher productivity and higher income per capita in rural areas requires lower agent density (1 to 1,243 active rural people), but higher number of extension agents (34,364) as its rural population is substantially larger 42.70 million (FAOSTAT, 2011).

Country-specific AgGDP investment requirements

Expressing the annual investment requirement in terms of a percentage of the countries' agricultural output or GDP allows a global comparison of spending. Figure 2 shows a visual interpretation of the % spending and a comparison of the actual spending (the size of the bubble). Figure 2 shows that about half of the countries should spend more than 1% of their respective share of GDP derived from agriculture and about a quarter of the countries need to spend more than 2% of their AgGDP.

Appendix 1 provides the results data on individual countries and their investment targets for agricultural extension in the baseline and climate change scenarios. The list provides a summary on the required number of public and private extension agents, on the annual public and private investment (in million US dollars) and on the investment relative to agricultural production (% of AgGDP). These figures help to compare countries in different regions around the world. Current investment figures were collected through a global investment survey (FAO/IAP, 2011, unpublished), but not many countries have the figures on what is invested in extension in their country.

Level of investment compared to the country specific target

Comparing the EIM results with the investment survey we identified four groups of countries:

1. The majority of the 35 countries, where current investment data was available (particularly in African and Asian countries with high poverty levels) are far below the investment target in terms of number of extension agents and annual investment in extension services.
2. Some countries perform well in terms of number of agents (e.g. China, Colombia, Ethiopia and Turkey), but they spend only a portion of the required average cost per agent. This still leaves extension under-financed, since most of the budget covers only salaries with severely insufficient investment in operational costs, capacity development, networking and extension monitoring and – importantly – in programmes that benefit smallholders.
3. In two Latin American countries (Costa Rica, El Salvador), the reported annual investment exceeds the target, but they do not have sufficient numbers of agents (e.g. they report

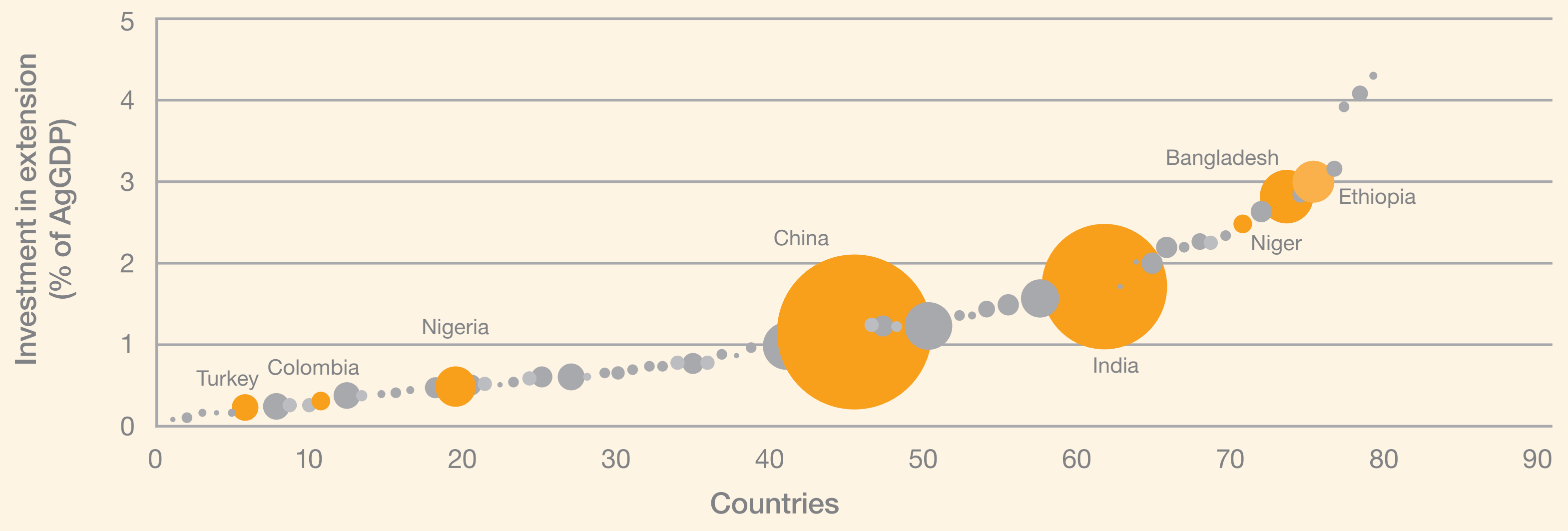

FIGURE 2: ANNUAL INVESTMENT REQUIREMENT AS A PERCENTAGE OF THE AGRICULTURAL GDP (2009) AND THE REQUIRED ACTUAL INVESTMENT (BUBBLE SIZE) IN THE BASELINE SCENARIO

over 1.13% investment of the AgGDP in El Salvador with 584 public and private extension agents compared to the model requirement of 0.50% investment of the AgGDP and 1129 extension agents in the baseline scenario – this may suggest an extension system that works with groups and producer organisations, and has more programmes and other non-staff investments (e.g. information and communication technologies, ICTs).

4. The last group consists of countries whose performance exceeded the calculated investment requirement (e.g. Chile and Gambia). For instance, Chile spent 1.12% of its AgGDP on extension in 2009, with 900 extension staff in the public and 390 agents in the private sector. This compares with the model results on extension investment requirements of 0.21–0.28% of AgGDP and 930 to 1,184 extension agents, respectively, in the baseline and climate scenario. Chile currently uses a five times higher average cost per agent compared to the extension model. In our view, investment should not be reduced in these countries as the additional investment goes beyond eliminating poverty and addressing climate change, by further increasing the levels of wealth.

Access to information and its impact

Improving information access (internet, mobile phone subscriptions and radios) has significant impact on the level of development and on the required level of investment in extension. In order to monetise the impacts we ran a few scenarios (Table 1). The average weighted score of **Ethiopia** is 843 people per extension agent, which was derived from the average weighted development index (22.22). This average ranking index and sub-indices (highlighted in brackets) take a value 1 to 94 (average rank score). A lower rank indicates higher need for extension, so an inverted rank/scale was applied to the values of poverty headcount ratio (% of population) and prevalence of undernourishment (% of population) due to their negative correlation to the 'one extension agent per 1,000 adult rural population' ratio. The sub-indices for Ethiopia derived from the ranking are: population density (59), poverty (14) and information access (17). The three components of information access are: internet access (5), mobile phone subscription (6) and radios (39). Improving mobile network and phone subscription from the current 37 per 1,000 to at least 160 per 1,000 people and increasing internet access from 4 to 10 people per 1,000 in Ethiopia would result in a 7 million USD saving in the annual investment in extension services, according to the extension model. We expect to have also an indirect impact on the poverty score through improved information and market access, which would add to the annual savings.

In **Mali** the population density rank (2), average poverty (38) and information access (10) parameters are low; which results in an agent ratio of 722 and an annual expenditure of 36.1 million USD in the climate change scenario. Increasing information access from (10) to (40) would reduce the number of extension agents from 6,488 to 5,705 and decrease the annual expenditure by 7.9 million USD. In **Bangladesh**, the information access indicators for internet (4), mobile subscription (36) and radios (3) shows a recent surge in mobile network and subscribers; according to the latest available data there are 347 subscribers per 1,000 people. If Bangladesh were to increase the average information access rank from (14) to (30), it would result in annual savings on extension investment of 30 million USD and if it were increased from (14) to (40) (Table 1), it would result in an annual saving of 48 million USD. It corresponds to a level of about 60 internet users, about 400 mobile subscribers and about 200 radios per 1,000 people. Nigeria and Pakistan have an average internet access over (40).

The savings that could be made through increased information access are enormous, given the accumulating effect over the years. Hence, the investments for improved ICTs in rural areas are worthwhile, given the high opportunity costs of not investing in ICTs.

Improvements in poverty and nutrition and their impact on investments

Although **Bangladesh** has recently made

TABLE 1: IMPACT OF IMPROVED INFORMATION ACCESS ON EXTENSION INVESTMENT

Country	Internet access per 1,000 people	Mobile subscription per 1,000 people	Radios per 1,000 people	Hypothesis	Annual saving on extension investments (million USD)
Ethiopia	4 (5)*	37 (6)	185 (39)	Mobile subscription from 37 to 160; Internet access from 4 to 10; Radios from 185 to 200 per 1,000	7
Mali	10 (15)	271 (23)	131 (24)	Increasing average information access rank from (10) to (40)	8
Bangladesh	3.2 (4)	347.2 (36)	64 (3)	Increasing average information access rank from (14) to (40)	48

TABLE 2: IMPACTS OF MDG GOALS ON EXTENSION INVESTMENT

Country	GNI per capita in current Int. Dollar	Poverty by headcount ratio at 2$ a day (PPP)*	Prevalence of under-nourishment (% of pop)	Hypothesis	Annual saving in extension expenditure (million USD)
Bangladesh	1,460	81.33	27	Reducing poverty headcount ratio by about half to 40%	25
Angola	4,830 (60)	70.21 (30)	41 (6)	Reducing undernourishment by half to 20%	3

significant progress in information access, it still has very high poverty rates – 81% of the population lives on less than US$ 2 a day (PPP) according to World Bank statistics (2005). Reducing this figure by half, to 40.5% of the population, would result in a saving of 25 million USD annual investment in extension (Table 2). Many families that escape poverty could make better use of mobiles and other ICTs, if they were available at an affordable cost. This would top up the annual saving in extension investment, if we consider also the indirect effect on information access. **Angola**'s GNI per capita increased ten-fold in the last decade; the country has enough resources to tackle poverty and undernourishment. If they could reduce the prevalence of undernourishment to 10%, it would result in an annual savings in extension of 5.41 million USD.

This example shows that it is important to target smallholder farmers, as reduced poverty will reduce investment requirements in extension. Potential savings made by improving livelihoods and information access accumulates over the years and makes an important difference.

Regional differences

Investment requirement in agricultural extension in terms of percentage of agricultural GDP (investment intensity) is on average 1.91 to 2.59% in 38 countries in sub-Saharan Africa (SSA) in the baseline zero hunger and climate change adaptation scenarios, respectively. Yet, individual country results show significant differences, with lowest investment requirements in Gabon and Nigeria and highest in Burundi and Lesotho. The average investment in extension is 1.45 to 2.16% of AgGDP in 16 countries in South and East Asia (SEA) – with the lowest share in Malaysia and South Korea and the highest in Nepal and Bangladesh. In 10 countries of the Near East and North Africa (NENA) region, average investment requirement is 0.54–0.88% of the AgGDP – with lowest share in Lebanon and Turkey and highest share in Egypt and Jordan. In 20 countries of Latin America and the Caribbean (LAC) region, the average investment intensity is 0.44–0.68% of the AgGDP, with the lowest share in Argentina and Uruguay and the highest share in Bolivia and Honduras (excluding Trinidad).

The regional differences in extension investment become more apparent in Figure 3 when we compare countries of the four regions (SSA, SEA, NENA and LAC). In each region we sorted the countries by the value of the investment requirement in % of AgGDP in order to provide a visual comparison for the regions.

Evidently, countries of the LAC and NENA regions can afford to spend below 1% of their AgGDP due to their relatively higher average income per agricultural labourer, and most of SEA and SSA countries should invest between 1 and 3% (with some cases of 4% or more) of their respective AgGDP: Burundi, Chad and Lesotho in both zero hunger and climate scenarios and Eritrea, Malawi and Zimbabwe in the climate scenario. Congo and Ethiopia are just a few percentages below 4%. Some countries with insufficient data (e.g. Haiti and Somalia) would also be in this group according to the authors. These countries are often characterised by large populations and more pervasive and deeper poverty.

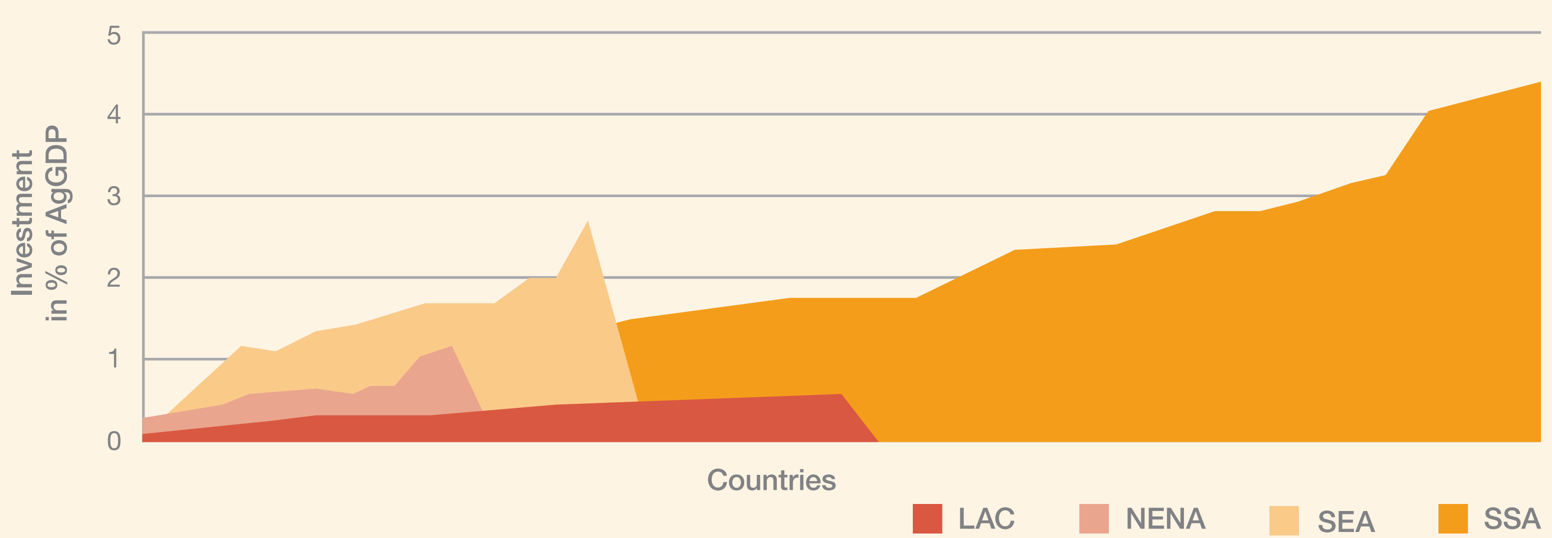

FIGURE 3: INVESTMENT IN AGRICULTURAL EXTENSION IN % OF THE AgGDP FOR REGIONAL COMPARISON

CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS

Our research suggests that most low-income countries need to make stronger financial commitments in order to meet their rural development, poverty and climate change challenges and objectives, especially in the African and East Asian region. In many low-income countries, public investment has been reduced to paying salaries of the public extension agents, which is not a sufficient investment to achieve zero hunger. Investments in promoting a market of extension services providers and in developing extension related programmes that benefit smallholders are required. The quality of spending is as important as the overall spending. Additional investments should be focused on the priority investment areas of information, technology and market access (including infrastructure) and capacity development for extension to increase efficiency and effectiveness. The latter depends on key factors relating to governance and management structures of the extension system, its capacity and flexibility to respond to the diverse and changing demands of smallholders, and to the policy environment and advisory approaches.

An increasing proportion of extension services is now being carried out by non-public service providers (NGOs, farmer organisations, private enterprises). This requires public investments in non-public extension services when these services are addressing non-profitable poverty and climate change objectives. Private investments should also be encouraged to finance agricultural and rural extension systems in an innovation framework. These include new cost-sharing arrangements in which farmers and their organisations pay a part of the service costs, depending on their capacities. In the upper-middle income countries successful examples show a transition to the 'who benefits pays' practice; but this is a fragile policy and inefficient pro-poor strategy in the poorest countries. In the least developed countries, public investment should be promoted in conjunction with development programmes that support extension and advisory services. Development aid can supplement the investment efforts of poor countries. A 1% AgGDP investment by the country could be topped up to reach the required investment target and would balance the investment efforts required to fight hunger and poverty between lower and higher income countries.

In this study the investment requirements are based on the number of extension agents (public and non-public) multiplied by the cost per agent (including all extension related costs). This is used as a proxy to estimate the overall extension investments required. However, the derived number of extension agents should not be used for extension planning, as the specific local context must also be considered. The model could not accommodate the investment difference, which would occur between extension services advising individual farmers, compared to those advising groups and producer organisations (POs). Data are not available on the number of POs and their organisational capacities. However, we can assume that the difference between these two approaches is significant in terms of its outreach and impact. Hence the promotion of POs will not only reduce extension investments, but will also increase their capacities: (1) in identifying and demanding their priority advisory needs, (2) in providing extension services (e.g. farmer-to-farmer approaches, employment of extension agents by POs), (3) in jointly accessing markets and (4) in participating in decision-making related to research and extension policies and investments.

There is need for more reliable extension and investment data and more regular and sustainable data collection in the countries. National extension platforms composed of service providers (public, NGOs, POs and private enterprises) could largely contribute to overcoming this information gap. Better data would contribute to increasing the precision of the model's results and its recommendation for policy formulation. The methodology used in this type of investment assessment could benefit from the results of extension impact assessment studies that identify key parameters (e.g. information access and poverty) and their relative contribution (weights) to the extension investment requirements (e.g. an econometric model could re-define the weights of the selected parameters that we used in the study for poverty (3), information access (2), and population density (1).

Further research is required on how an extension system could be transformed in order to make investments more effective and cost efficient. Reform and transition of the extension systems often require shifting to private or commercialised services, to modern sharing of knowledge and information, to improved market access and to a more prominent role of farmer organisations in extension governance, including policy formulation and investment decisions. However, little is known about the link between effectiveness of investments and the way extension systems are organised and the different dynamic and flexibility this creates. This also holds true for the different ways of investing in extension. Most investments finance the supply side of extension, but very little on the demand side and the farmer organisations' capacities to play their roles in extension. Research is required on new financing mechanisms, particularly the testing of pull mechanisms; i.e. of financing of the demand side of extension in order to see its effect on effectiveness and efficiency of extension as well as on empowerment of smallholder farmers and their satisfaction with the advisory services they are receiving.

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LITERATURE CITED

FAO. 2003. *Anti-Hunger Programme: A Twin-Track Approach to Hunger Reduction: Priorities for National and International Action*. FAO, Rome, Italy.

FAO. 2006. *World Agriculture towards 2030/2050, Prospects for Food, Nutrition, Agriculture and Major Commodity Groups*. Global Perspective Studies Unit, FAO, Rome, Italy.

FAO/IAP. (2011, unpublished). *Global Investment Survey and Investment Assessment Project Report*. FAO, Rome, Italy.

Roseboom, J. 2004. 'Agricultural research and extension funding levels required to meet the anti-hunger programme objectives.' Paper prepared for FAO. Rijswijk, The Netherlands. http://www.fao.org/sd/dim_kn4/docs/kn4_040401a1_en.pdf

SOPAC/UNEP (2004) Building Resilience in SIDS, The Environmental Vulnerability Index, URL: http://www.islands.unep.ch/EVI%20Final%20Report%202005.pdf

South Pacific Applied Geoscience Commission (SOPAC). 2004. *The Environmental Vulnerability Index (EVI)*. South Pacific Applied Geoscience Commission, SOPAC Technical Report 384.

Szonyi, J., De Pauw, E., La Rovere, R. and Aw-Hassan, A. 2010. 'Mapping natural resource-based poverty, with an application to rural Syria.' *Food Policy* 35 (1): 41–50.

World Bank. 1981. *Agricultural Research* – Sector Policy Paper. World Bank, Washington, DC, USA.

ONLINE DATABASES

FAOSTAT
http://www.faostat.fao.org

IFPRI. ASTI Agricultural Science and Technology Indicators.
http://www.asti.cgiar.org

International Monetary Fund. Online Database.
http://www.imf.org/

World Bank, World development indicators.
http://www.data.worldbank.org/data-catalog

World Resources Institute (WRI). EarthTrends, Online Database.
http://www.earthtrends.wri.org

APPENDIX 1: INVESTMENT REQUIREMENT FOR AGRICULTURAL EXTENSION – EIM RESULTS (2011)

All figures of the Baseline and Climate Change Scenario cover the public and private sector.	Zero Hunger Baseline Scenario (2011)			Climate Change Scenario Annual Exp. required in % of AgGDP (2009)
	Number of Extension Agents	Annual Exp. required (mill USD)	Annual Exp. required in % of AgGDP	
Afghanistan	11821	58.34	1.63	2.44
Algeria	5775	59.33	0.60	0.94
Angola	4441	41.79	1.39	1.94
Argentina	1203	14.65	0.08	0.12
Bangladesh	76242	411.36	2.82	3.50
Benin	2501	14.33	0.88	1.37
Bolivia	1624	11.42	0.71	1.01
Botswana	369	4.20	1.97	2.78
Brazil	11279	140.61	0.24	0.40
Burkina Faso	7055	36.89	1.56	2.18
Burundi	5262	23.55	6.43	9.18
Cambodia	7239	39.96	1.61	2.31
Cameroon	4491	29.03	0.79	1.11
Central African R.	2373	12.11	1.40	1.44
Chad	6123	33.29	4.09	4.56
Chile	777	10.34	0.17	0.28
China	356958	3404.30	1.14	1.95
Colombia	4912	51.98	0.33	0.52
Congo, Dem. Rep.	24997	112.39	2.64	3.83
Congo, Rep.	826	6.03	1.67	2.30
Costa Rica	675	7.68	0.39	0.64
Cote d'Ivoire	4057	25.66	0.61	1.14
Dominican Rep.	1294	13.36	0.47	0.75
Ecuador	1907	18.99	0.64	1.01
Egypt, Arab Rep.	20857	158.65	1.03	1.67
El Salvador	877	8.12	0.38	0.66
Eritrea	2766	13.25	3.89	5.22
Ethiopia	44580	216.29	2.98	3.95
Gabon	90	1.08	0.22	0.33

APPENDIX 1: INVESTMENT REQUIREMENT FOR AGRICULTURAL EXTENSION – EIM RESULTS (2011) *CONTINUED*

All figures of the Baseline and Climate Change Scenario cover the public and private sector.	Zero Hunger Baseline Scenario (2011)			Climate Change Scenario Annual Exp. required in % of AgGDP (2009)
	Number of Extension Agents	Annual Exp. required (mill USD)	Annual Exp. required in % of AgGDP	
Gambia, The	334	1.70	0.97	1.50
Ghana	5397	30.36	0.66	1.06
Guatemala	2957	24.56	0.56	0.86
Guinea	4208	20.59	2.36	2.99
Guyana	249	1.70	0.53	0.80
Honduras	1641	11.96	0.74	1.18
India	460560	2982.63	1.66	2.61
Indonesia	53347	416.62	0.96	1.65
Iran, Islamic Rep.	10315	106.67	0.48	0.78
Jamaica	445	4.73	0.63	1.03
Jordan	546	5.31	1.16	1.88
Kenya	15647	90.31	1.54	2.20
Lao	2638	15.83	1.32	1.56
Lebanon	211	2.62	0.17	0.22
Lesotho	801	5.03	4.37	5.21
Liberia	1103	4.96	1.12	1.17
Madagascar	9327	47.01	2.64	3.33
Malawi	6858	32.56	2.92	4.04
Malaysia	2920	34.97	0.27	0.45
Mali	5362	29.94	1.21	1.58
Mauritania	1072	6.62	1.26	1.70
Mauritius	298	3.58	0.91	1.52
Mexico	9980	129.73	0.37	0.59
Morocco	6119	52.14	0.52	0.86
Mozambique	9434	47.94	2.24	2.83
Nepal	14878	75.60	2.18	3.09
Nicaragua	1255	7.84	0.68	1.03
Niger	9234	45.00	2.55	2.74

APPENDIX 1: INVESTMENT REQUIREMENT FOR AGRICULTURAL EXTENSION – EIM RESULTS (2011) *CONTINUED*

All figures of the Baseline and Climate Change Scenario cover the public and private sector.	Zero Hunger Baseline Scenario (2011)			Climate Change Scenario Annual Exp. required in % of AgGDP (2009)
	Number of Extension Agents	Annual Exp. required (mill USD)	Annual Exp. required in % of AgGDP	
Nigeria	34570	222.12	0.50	0.85
Pakistan	57649	361.62	1.29	2.04
Panama	378	4.40	0.35	0.55
Paraguay	1148	9.02	0.47	0.72
Peru	3880	39.23	0.59	0.88
Philippines	14229	103.17	0.61	1.03
Rwanda	4924	25.23	2.24	3.10
Saudi Arabia	1911	35.01	0.28	0.41
Senegal	3659	23.00	1.26	1.86
Sierra Leone	2202	10.73	1.34	1.81
Sri Lanka	8885	66.68	2.04	3.27
Sudan	12547	81.89	0.78	1.11
Suriname	62	0.65	0.62	0.88
Swaziland	446	3.55	1.54	2.37
Syrian Arab R.	4359	35.04	0.54	0.93
Tanzania	19153	99.74	1.27	1.73
Thailand	20557	200.49	0.97	1.58
Togo	2040	10.37	0.95	1.41
Trinidad and T.	482	8.47	6.98	11.18
Tunisia	1574	15.27	0.42	0.68
Turkey	8951	115.32	0.20	0.33
Uganda	13537	69.36	2.30	3.41
Uruguay	96	1.27	0.06	0.10
Venezuela, RB	688	9.46	0.14	0.23
Vietnam	31369	196.38	1.50	2.48
Zambia	5031	31.14	1.58	2.07
Zimbabwe	4830	23.74	3.17	4.20