

3 Lessons for out-scaling and up-scaling from Rates of return to research

Background

DFID commissioned a literature review and critique⁶ to investigate what is known about the rates of return on research. In the context of the paper, 'agricultural research' included both agricultural research and extension. The authors of the paper suggest that the jury is still out on the rates of return to agricultural research and extension in developing countries. So, although research studies on the rates of return to research broaden our understanding, we cannot draw clear conclusions from the results so far. The authors of the document drew mainly on two key papers on public investment (Box 3.1).

Box 3.1

Rates of return: China and India

Two case studies⁷ modelled Chinese and Indian growth in the 1970s and 1980s and isolated and ranked the effects of different types of public investment.

For **China**, the study examined investments in agricultural R&D, irrigation, roads, education, electricity and telephone. Public investment in education had the most impact on reducing rural poverty. Agricultural R&D had the most impact on the growth of rural income.

For **India**, investments in agricultural R&D, roads, education, irrigation, power, soil and water, rural development and health were assessed. Public investment in roads had the most impact on reducing poverty. Public investment in research and development had the most impact on growth of productivity. Spending on power, irrigation and health had little impact on reducing poverty or productivity.

The broad conclusion was that if governments want the maximum impact for public expenditures aimed at a growth in productivity and a reduction in poverty in rural areas, they should spend it on agricultural research, education and building roads.

But, this finding cannot necessarily be applied to other developing countries. The economies of China and India grew rapidly in the 1980s and 1990s. The quality of institutions in China and India is well above the average for developing countries. So, the rates of return to research for economic growth and poverty reduction in these two fast growing economies may not be applicable to countries where institutional capacity is weak and agro-climatic factors are unfavourable.

Key points

- Studies show that there is a robust positive relationship between spending on research and development and economic growth.
- The relative merits of targeting agricultural research to low-potential areas compared to increasing investment in research in general are not yet clear.
- The conclusions from studies of rates of return on public investment in China, India and East Africa are of limited use in practice.
- The results of the study in Uganda suggest that agricultural R&D (extension) has a high payoff.
- The evidence for payoff on investment in agricultural research in fragile states is contradictory.
- Up-scaling research findings means understanding and managing the diverse interfaces between researchers and the wider environment.

Lessons learned

Studies show that there is a robust positive relationship between spending on research and development and economic growth. Studies show that the rate of return on research is many times the rate of return on other comparable investments. But, in order to maximise the benefits of agricultural research, national governments need to put rural infrastructure in place, make sure farmers have access to credit, stabilise output prices, and ensure ready supplies of seed and fertilisers.

Agricultural research in developing countries is considerably under-funded. Donor and multilateral agencies need to coordinate their support for research targeted to the poor in low-income developing countries.

Donors also need to support national agricultural research systems in developing countries. At least 5% of the funding for the agricultural sector should be ear-marked to support local agricultural research and strengthen capacity for research. Here, it should be remembered that 'agricultural research' in this context includes extension. This means that significant support needs to be given to strengthening the services that will be out-scaling and up-scaling research findings.

⁶ Kunal, S. and G. Hoare. 2005. Rates of return to research. Final report. DFID. The paper also dealt with rates of return to health research. The findings related to health are not directly included in this synopsis. However, this synopsis briefly mentions a model from health research that may be useful for out-scaling and up-scaling.

⁷ S. Fan, L. Zhang and X. Zhang. 2002. Growth and poverty in rural China: the Role of Public Investment. IFPRI Research Report 125. Washington DC. 'Government spending, growth and poverty in Rural India'. S. Fan, P. Hazell and S. Throat. 2000. American Journal of Agricultural Economics 82 No 4.

The relative merits of targeting agricultural research to low-potential areas compared to increasing investment in research in general are not yet clear.

Further studies in China and India found that returns to research in low-potential (unfavourable agro-climatic) regions were significantly higher than for high-potential regions (Box 3.2). At first glance, this suggests that it would be beneficial to target low-potential areas for investments in research relative to high-potential areas as the payoffs from investment will be higher.

Box 3.2

Payoffs from agricultural research in low-potential regions are greater than in high-potential regions

In **China**, the returns yuan-for-yuan on investment for production in the low-potential western region were around 13 yuan as compared to around 9 yuan in the high-potential coastal region. In the low-potential western region, 33 people were lifted out of poverty for every 10,000 yuan spent, but in the high-potential coastal region this was true of only two people.

In **India**, the returns on investment for production were about around 688 rupees in the low-potential rainfed areas as compared to about 63 rupees in the high-potential irrigated areas and 243 in the high-potential high rainfall areas. In the low-potential rainfed areas 0.05 people were lifted out of poverty compared to none in the irrigated and 0.02 in the high rainfall high-potential areas.

But, studies in East Africa⁸ found no clear distinction between the returns to research in high- and low-potential areas. These studies found that returns to investment in high-potential areas were still high and that there were no signs of diminishing marginal returns. This suggests that an overall increase in investment in research can pay large dividends, rather than investment in research that specifically targets low-potential regions.

The conclusions from studies of rates of return on public investment in China, India and East Africa are of limited use in practice.

In considering the conclusions of the studies we need to be aware that the source data is poor, and that the particular mathematical and statistical techniques used in the studies, like all such techniques, have limitations. The studies on China and India did not factor in the effect of research spilling over from neighbouring states, provinces or international agricultural research programmes (e.g. new seed varieties). These spillovers could distort the estimated rate of return for agricultural research. The studies also could not factor in specific differences between provinces or states, such as quality of governance. Because of this the rates of return could be over-estimated.

Nevertheless, these studies are helpful in understanding the effectiveness (or otherwise) of research in stimulating economic growth and reducing poverty.

The results of the study in Uganda suggest that agricultural R&D (extension) has a high payoff.

In Uganda, data on agricultural research at the national level was not available. So, the study made the assumption that allocations to agricultural research were proportional to allocations to agricultural extension. Thus the study essentially estimates the return to agricultural extension rather than to agricultural research. Although this means the results are not comparable to the results of the studies in China and India, the implication for out-scaling research findings is that agricultural extension (putting research findings into use) has a high payoff. In Uganda, the benefit-cost ratio for agricultural extension is 12.38, as compared to 2.72 for education and 7.16 for roads. The number of poor people lifted out of poverty for every million shillings invested in agricultural R&D (agricultural extension) is 58.39 as compared to 12.81 for investments in education and 4.6 for investments in health.

The evidence for payoff on investment in agricultural research in fragile states is contradictory.

The conditions that complement investment in agricultural research do not exist in fragile states (Box 3.3). For research investments to payoff (research findings to be taken up and lead to economic benefits) various conditions need to be met—the agro-climatic environment and infrastructure have to be favourable, markets have to be accessible, prices for outputs have to be stable, the costs of inputs such as seeds and fertilisers have to be reasonable, markets for credit have to be functioning, and people need to have good access to information. In fragile states, these conditions are absent.

Box 3.3

Payoffs from agricultural research in fragile states—the evidence is contradictory

Studies of rates of return from agricultural research to African countries show, for example 75% for maize in Burkina Faso and Ghana, 66–83% for rice in Senegal, and 66% for millet in Mali. Studies on poverty reduction in Sub-Saharan Africa find a close positive relationship between a reduction in poverty and a growth in agricultural productivity. And, these studies show that one of the most important factors in growth in agricultural productivity is investment in agricultural research and development.

However, there is some doubt as to the reliability of these estimates. The estimates seem to contradict the hard evidence of slow agricultural growth and an increase in poverty rates for much of Sub-Saharan Africa. There is no verification that the rate of return on agricultural extension is higher than the return on investment in other critical areas in fragile states—education, infrastructure and health.

⁸ Public expenditure, growth and poverty reduction in rural Uganda. Fan, S., X. Zhang and N. Rao. 2004. DSG Discussion Paper No 4. IFPRI Development Strategy and Governance Division. Public investment and poverty reduction in Tanzania: evidence from household survey data. Fan, S., D. Nyange and N. Rao. 2005. IFPRI Development and Governance Division, mimeo.

But, there are some ways that governments in fragile states have helped adoption of new technologies. These include support for producer prices, subsidies for inputs, subsidised credit for new technologies, and public investments in irrigation, roads and marketing systems. This suggests that out-scaling and up-scaling research findings is more likely to be successful in fragile states where such steps are being taken.

Up-scaling research findings means understanding and managing the diverse interfaces between researchers and the wider environment—political, professional and social. The way in which research has an influence is much more complex than the linear 'research leads to knowledge and then to action' model⁹. External influences are all-important. Research findings are seldom used directly. Often, they are used as a political tool to defer tough decisions. Change only occurs as a result of a gradual accumulation of evidence and weight of opinion. Any attempts to up-scale research findings need to acknowledge and account for these factors.

A model developed by Buxton and Hannay (1996) for health research is useful for thinking about how to involve stakeholders, particularly policy makers and planners, and get them to own processes of uptake of research findings. Networks and linkages between researchers and various stakeholders are very important. So is better dissemination of research results customised and targeted to specific audiences—policy makers, practitioners and academics.

This synopsis of lessons learned for up-scaling and out-scaling research into use is drawn from:

Kunal, S., Hoare, G. 2005. 'Rates of return to research. Final report'. DFID.

See

<http://www.research4development.info/pdf/ThematicSummaries/Returns%20to%20Research%20Final%20Report.pdf>

⁹ Buxton, M. and S. Hannay. 1996. The review gives no citation for this paper on the payback from health research.