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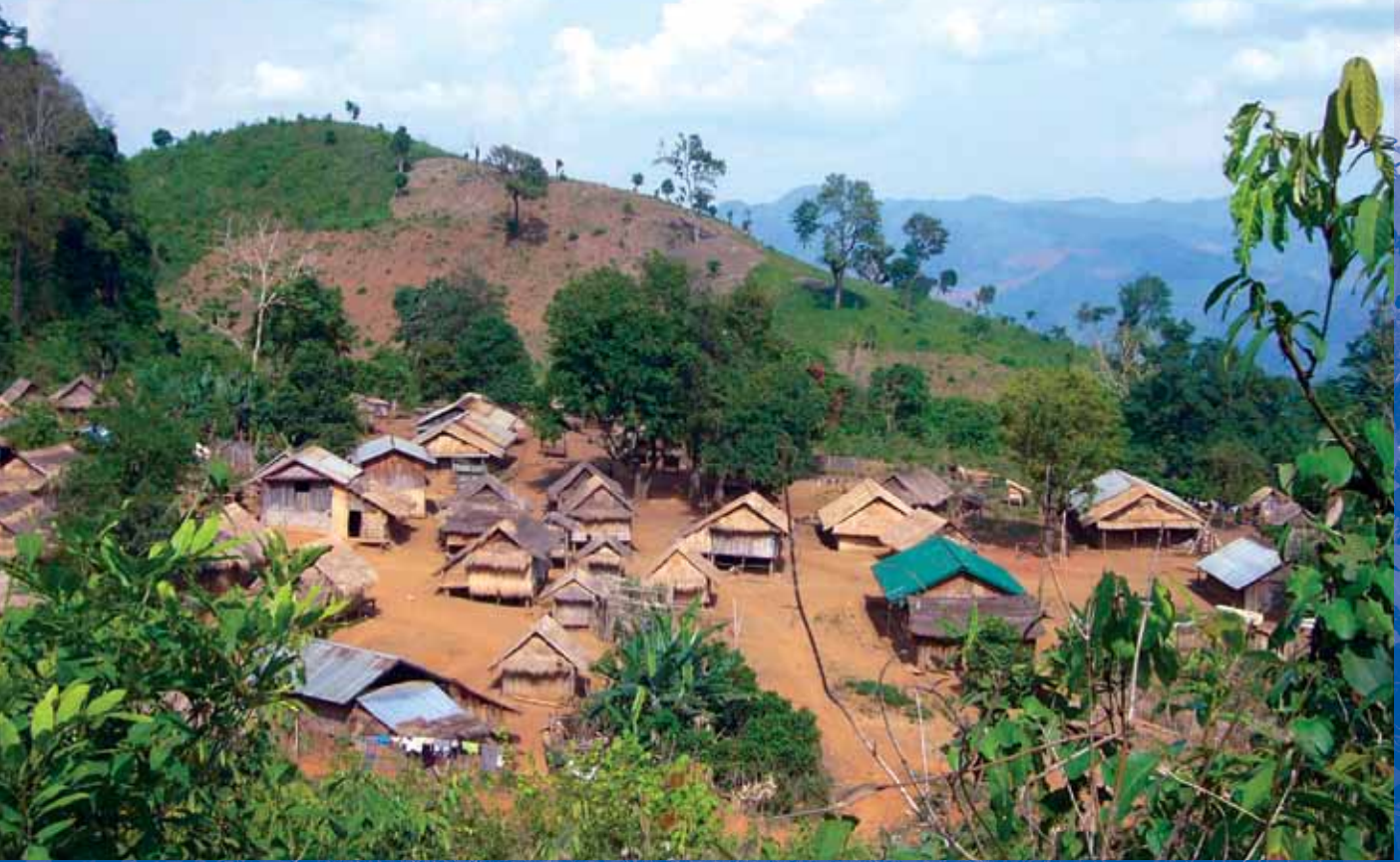
Trends 2009

Natural Resources in 2025 – Implications for Development

Opportunity of a turnaround

An expert reassessment 2005 – 2009



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What will be the future of people living on swidden agriculture in this village in Northern Lao PDR? (Photo: Cornelia Hett, CDE, 2009)

InfoResources Trends *compiles personal assessments of predicted changes by experts from the realms of politics and science, as well as from implementing agencies of NGOs around the world.*
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Revisiting *Imagineland*

Changing context and strategic orientation

InfoResources conducted a trends assessment in 2005. Eight internationally well-known experts were asked to assess the trends in natural resources and the poverty situation that least developed countries (LDCs) would be facing by 2025. The objective was to obtain an integrative view of emerging challenges facing sustainable natural resource management at the country level, and to develop recommendations for policy- and decision-makers. At that time, the overall development paradigm was highly influenced by neoliberal thinking. Economic growth rates in developing countries were impressive, reaching 5.5 percent in Africa and 6–7 percent in Asia. The number of people facing hunger was stable at about 840 million people. There was still a slight hope that the first Millenium Development Goal (MDG) could be achieved by 2015, despite the critical findings of the Millennium Ecosystem Assessment. Poverty Reduction Strategy Papers were considered a promising means to reduce poverty.

In recent years developing countries have faced highly dynamic changes affecting their natural resource base and their potential for development. Climate change mitigation policies gave rise to new markets. The overheated global economy and pent-up demand in emerging economies led to increasing resource shortages. Food and energy prices increased drastically; this coincided with financial turmoil. The global recession since mid-2008 has disproportionally affected least developed countries. It is expected that at present (2009) more than 1 billion people are facing hunger.

At the same time, major international agreements are about to undergo substantial adjustments: The Protocol of Kyoto is due for renewal – and the scope of a successor agreement still needs to be defined; the Millennium Development Goals are about to quietly expire; harmonisation efforts such as the Paris Declaration are more and more in contradiction with national interests. In a nutshell, the dynamics of socio-economic and institutional change have been accelerating with unprecedented speed.

The Millennium Ecosystem Assessment, the 2007 IPCC Report, the International Assessment of Agriculture Knowlegde, Science and Technology and other studies have clearly revealed an urgent need for strategic reorientation. In order to develop adequate strategies, decision- and policy-makers at government institutions, but also in international cooperation organisations face a growing need to anticipate mid-term trends in natural resources and in the socio-economic context. However, in day-to-day work, urgent sectoral and short-term matters constrain leaders in strategic thinking about mid- to long-term trends.

Approach of the reassessment

Asking experts to identify emerging trends based on their knowledge and experiences is an estabilished approach. However, due to the complexity of human–ecosystem interactions it is impossible to make definite predictions about the future. Assessments of trends are always subject to uncertainties and shaped by paradigms and values; accordingly, they need to be reviewed from time to time. Four years after the first trends assessment, and taking into account recent changes in the development context, a critical reassessment of *InfoResources Trends 2005* is both timely and useful.

Depletion of Natural Resources – Implications for Development: Trends 2005
www.inforesources.ch/pdf/trends_2005_e.pdf

World Economic Situation and Prospects
www.un.org/esa/policy/wess/wesp2006files/es_2006_english.pdf

Recent development in the number of people facing hunger as one indicator of poverty:

Period	Number of persons
1990–92	843 millions
2003–05	848 millions
2007	923 millions
2009	1.020 billion (expected)

Undernourishment around the world
ftp://ftp.fao.org/docrep/fao/011/i0291e/i0291e02.pdf

1.02 billion people hungry, FAO News
www.fao.org/news/story/en/item/20568/icode/

***Millennium Ecosystem Assessment**, 2005*
www.millenniumassessment.org/en/index.aspx

***International Panel on Climate Change (IPCC) Report**, 2007*
www.ipcc.ch/publications_and_data/publications_and_data_reports.htm

***International Assessment of Agriculture Knowledge, Science and Technology for Development (IAASTD)**, 2009*
www.islandpress.org/iaastd

For more details on the methodology, see Annex I, page 20

A more detailed description of Imagineland *can be found in Annex IV, page 23*

Experts' profiles, see Annex II, page 21

"In my view the methodology is okay for this type of quick assessment. However, it only looks at the dynamics. What I miss is the current state of the environment and of development, which varies a great deal between countries. It is difficult to think of an 'average' country like Imagineland without considering the variance among countries."
Hans Hurni

For more information on the findings of the assessment conducted in 2005 see ***InfoResources Trends 2005*** *www.inforesources.ch/pdf/trends_2005_e.pdf*

Aspects of the methodology

- Like in 2005, a fictive country called *Imagineland* served as an entry point and common reference. *Imagineland* was designed in 2005 to represent a "typical" LDC. Thus, *Imagineland* is characterised by a rural economy in which subsistence farming prevails, but increasingly faces competition with cash crop production. Politically, the country has a weak democratic system. The rural areas are characterised by high population growth, and about 35% of the rural population are poor. Education facilities and health infrastructure are very limited. The region remains rich in biodiversity, although quite a large number of species are endangered due to intensified land use. More and more conflicts over water resources are emerging.
- The common reference has helped to reveal general tendencies and prevented the discussion from focusing too closely on regional and context-specific particularities. However, in some cases this approach bears the risk of neglecting certain important factors that might be decisive for development in specific individual countries.
- Compared to 2005, a more balanced selection of experts in terms of gender and origin (South and North) was envisaged in 2009. However, in order to allow for coherent comparison with the 2005 assessment, half of the experts consulted then were invited to participate again.
- In two subsequent e-mail interview rounds, the experts were asked to assess the probability of a number of major and subtle changes, as well as the impacts these changes would have on natural resources, poverty alleviation and food security. Based on replies received the InfoResources team developed three hypotheses on how policies should be reoriented. In a third interview round the experts were invited to discuss these hypotheses and develop their specific policy recommendations.

This reassessment does not claim to be comprehensive or scientific. However, the present publication, which synthesises the experts' inputs, aims to provide food for thought and inform policy- and decision-makers on trends that LDCs are likely to be facing by 2025.

Insights from the 2005 assessment

Under the assumption that no major changes would occur over the next 20 years, experts anticipated in 2005 that high population growth and heavy dependency on agriculture (60%) would be the decisive factors influencing natural resources and the poverty situation in *Imagineland*. The pace and character of industrial and urban development was expected to play a critical role as well: rapid industrial growth would aggravate overall pressure on the environment, while agricultural pressure on natural resources would not cease to increase before the country succeeded in generating sufficient off-farm income opportunities. Overall, poverty was expected to remain widespread.

The experts anticipated that up to 2025, development constraints would not arise from the shortage of any single resource, but from increased pressure on the entire ecosystem. Medium-potential areas were expected to be affected most by natural resource degradation. The experts' opinions on the impact of climate change differed, but they all agreed that adaptation capacities would become crucial.

Ongoing efforts towards more sustainable natural resource management were not assessed as sufficient at that time. Reforming local institutions, strengthening government accountability and enhancing capacities of international delegations were clearly identified as the most promising measures for reducing pressure on resources.

Trends in natural resources

Change	Probability that change will materialise by 2025	Impact on poverty alleviation	Impact on natural resources
Decrease in arable land due to soil and water degradation has become precarious for livelihoods	High to very high probability	– –	n a
Climate change hazards have increased drastically		– –	– –
Biodiversity loss has impacted on livelihood options (diverging assessment of probability)		– –	n a
Energy scarcity has become as relevant as water scarcity (diverging assessment of probability)		– –	– –
Outbreak of major zootic and crop **diseases**		n a	n a
Collapse of major fisheries	Probable	n a	n a

Key:

***Probability** that a given change will materialise in Imagineland by 2025: dark blue signifies very high probability, white signifies very low probability.*

***Impact** of a given change on poverty alleviation and on natural resources:*

++ *very positive;* + *positive*

– – *very negative;* – *negative*

( ) *diverging assessment by 2 or more experts*

n a *not assessed*

The results are not statistically significant.

There is unanimous consensus among the experts that degradation of the natural resource base (land, soil, water, biodiversity) of *Imagineland* will continue to the point where livelihoods are threatened and an increasing number of food-producing agro-ecosystems will collapse. Industrialisation of agriculture, increasing competition between food and biofuel production, unsustainable consumption patterns in developed countries and more frequent climate change hazards will interact, leading to severe degradation of natural resources.

- Experts do not doubt that **climate change impacts** will increase and may reach a threatening level as of 2050 and beyond, but hopefully not yet by 2025. It will disproportionally affect poor countries.
- **Loss of biodiversity**, an ongoing subtle change, is not seldom neglected by governments, as their attention is absorbed by seemingly more urgent issues such as population pressure or food crises. Experts express their fear that this shortcut will take its toll in the long term, when ecosystem degradation will manifest itself in terms of loss of services, and in the end impact on livelihoods.
- **Energy scarcity** due to reduced availability of fossil fuels will increase demand for alternative sources of energy, among others for bioenergy, and thus trigger pressure on land, forests and water.
- **Incidence of zootic diseases will continue to increase** as a result of expanding industrialised meat production (which will not become dominant, however, due to feed scarcity and lack of financial means). At the same time, the ability to respond adequately to diseases will increase as well.
- Moreover, experts point out that in some areas the **collapse of fisheries** is a reality already today. The situation will worsen unless more effective management regulations are enforced, including restriction of wasteful harvesting methods.

"Climate change will accelerate and will begin to send a second series of regional shock waves around the planet as of 2020 or 2025 onwards. This will first be felt in the form of water scarcity, followed by sea level rise, and will possibly also be affecting the North Atlantic circulation."
Othmar Schwank

"Biodiversity loss is becoming a rather feeble phrase to describe the imminent mass extinctions."
Janice Jiggins

"Human conflicts and threats from extreme weather events will have become more frequent, resulting in localised but increased incidents."
William Jackson

"The resulting narrower food-security base has implications on vulnerability to climatic hazards as well as livestock and plant diseases and pests."
Margret Ngigi

Degradation of natural resources: a strong impediment to poverty alleviation
Unsurprisingly, the assessment provides a compelling argument that poverty alleviation is closely linked with natural resource management (NRM) in developing countries dominated by rural economies, such as *Imagineland*. The ongoing degradation of natural resources is increasing people's vulnerability. In this type of context, poverty alleviation can only succeed if natural resources degradation is stopped and natural resources are managed sustainably.

Major negative implications for food security
The decrease in arable land due to soil and water degradation, in combination with biodiversity loss, will have an overall negative impact on food security unless alternative livelihood options are enhanced. Loss of biodiversity reduces ecosystem services and narrows the food-security base, thus increasing vulnerability to climatic change, pests and diseases.
Energy scarcity will lead to increased costs and will thus possibly have adverse effects on food security: income and labour will increasingly have to be spent on obtaining sufficient energy and, in addition, transport of products to markets will be constrained. Finally, some experts also pointed out that growing geo-political tensions might affect food security.

Trends in land use

Change	Probability that change will materialise by 2025	Impact on poverty alleviation	Impact on natural resources
Small-scale farming remains dominant (diverging assessment of probability)		– (+)	– (+)
Climate change mitigation in the land use sector has become a major service (diverging assessment of probability)	Probable	+	+
Resource-efficient land-use systems have expanded		+	+ +
Gene-modified crops are widespread		– (+)	– –
Livestock production has increasingly become industrialised		n a	n a
Biofuel crops have become major cash crops		n a	n a
Industrialised, large-scale agriculture has increased, farmland has been merged (diverging assessment of probability)	Low probability	– –	– –

Key:

Probability *that a given change will materialise in Imagineland by 2025: dark blue signifies very high probability, white signifies very low probability.*

Impact *of a given change on poverty alleviation and on natural resources:*

++ *very positive;* + *positive*

– – *very negative;* – *negative*

( ) *diverging assessment by 2 or more experts*

n a *not assessed*

The results are not statistically significant.

"Agriculture will have re-emerged as a central land-use activity providing multiple services to society."
Hans Hurni

Overall the experts expect that agriculture is about to regain recognition as a central activity providing multiple services to society. However, trends regarding land use were not predicted with the same clarity as trends in natural resources. Nevertheless, in most cases the experts' assessments do provide a clear tendency despite certain diverging opinions on the proba-

bility of changes and on the severity of their impacts on natural resources, poverty alleviation and food security.

- A majority of the experts expect that **small-scale farming** will still be the most widespread form of agriculture in 2025 in countries like *Imagineland*, representing the main source of livelihood for most poor people. Trends towards more **industrialised large-scale farming and livestock production** – although observed in some parts of the world – will not become dominant. On the contrary, one expert argues that large-scale farming will be reconverted to small-scale agriculture by 2015 under the pressure of increasing energy prices.
- **Resource-efficient land use** will be a result less of pro-active global policies than of increasing energy prices and water scarcity. Possible food crisis in the period of 2010–2020 predicted by one expert might trigger a transition towards more sustainable land-use practices, also in terms of soil carbon content. However, the experts' assessments diverge in this matter, even though they expect that the future Copenhagen agreement on climate change will recognise land use as a major element in combating climate change. Half of the experts believe that **climate change mitigation** in the land-use sector will eventually become a major service, but they heavily questioned whether this will have happened by 2025.
- The possibility that **gene-modified crops** (GMO) could become widespread is assessed as slightly less than probable due to the high dependency on subsistence agriculture. Although GMO seeds might be sown more widely in the beginning of the period under consideration, farmers are expected to eventually revert to traditional seeds because GMO crops adapt less easily to climate change.
- The spread of **crops for biofuel production** will take place, even though this is undesirable from social and environmental points of view. However, it will be restricted by the trade-off between cash-crop production and production for food security at household level.

"Although genetically modified crops will come into widespread use, I do not agree that 'the consequences for poverty are largely seen as positive'. The main GM crops are the commercial ones, not the staple food for the poor."
Michelle Chauvet

Institutional framework: poverty orientation decisive

Assessments of the impacts of these trends in land use on poverty alleviation varied considerably; one exception was the very negative impact that experts expect industrialised large-scale agriculture to have. Payment mechanisms for mitigation services can only have positive effects if they are accessible to poor farmers and if poor farmers' land-use rights are respected. GMO crops will hardly contribute to poverty alleviation unless the monopolies of international corporations in this field are transformed into a more equity-oriented arrangement.

Small-scale farming: key to sustainable NRM

Experts agree that gene-modified crops and industrialised large-scale agriculture will have highly negative consequences for ecosystems, whereas the impact of small-scale farming depends heavily on how resources are managed. Embedded in an adequate framework with appropriate incentives, small-scale farming can play a key role in achieving resource-efficient, sustainable land use.

Resource-efficiency: a contribution to food security

Resource-efficiency alone will not be sufficient to improve food security. Food availability will remain constrained by resource scarcity and uncertain land ownership, as well as limited market access for buying inputs and selling cash crops. Industrialised large-scale land use will reduce the diversity

of agricultural products and marginalise small-scale farmers, thus endangering food security in rural areas; at the same time it will be very important in guaranteeing food security for urban populations.

Social trends

Change	Probability that change will materialise by 2025	Impact on poverty alleviation	Impact on natural resources
Migration to economic centres has increased	High probability	(+) –	(+) –
Megacities are facing **urban social crises** induced by food supply crises		n a	n a
Birth rate and population growth are on the decrease		+	+
Access to information on NRM and agriculture for poor people has improved significantly due to ICT (diverging assessment of probability)		+	+
Primary school enrolment of girls and boys has improved and has achieved the MDG target	Probable	+	+
The rural population's health has improved significantly		+ +	+ +
Vaccination against AIDS/HIV has become effective		+ +	+
Back-migration from megacities to the rural areas has begun to occur		n a	n a
Democratic decentralised government structure has become fully operational (diverging assessment of probability)		+ +	+ +
Consumption patterns in developed countries have become more sustainable		+	+ +
Institutional stability and land reform now guarantee equitable access to land also for women	Low probability to very low probability	+ +	+

Key:

***Probability** that a given change will materialise in Imagineland by 2025: dark blue signifies very high probability, white signifies very low probability.*

***Impact** of a given change on poverty alleviation and on natural resources:*

++ *very positive;* + *positive*

– – *very negative;* – *negative*

( ) *diverging assessment by 2 or more experts*

n a *not assessed*

The results are not statistically significant.

"Greater public consciousness with regard to environmental and health issues will have shifted markets for agricultural food commodities and products from being supply-driven to being consumer-driven." Margret Ngigi

The experts' assessment of social trends reveals that there are a number of ongoing positive processes and developments, e.g. improvements achieved in birth rate reduction and advancements in the area of education and (primary) school enrolment. These trends give reason for hope.
It is interesting that the social trends have a strong positive effect on both the situation or natural resources and poverty alleviation are seen as unlikely to materialise within the period up to 2025.

- While the experts anticipate that **migration to economic** centres will continue to grow in importance, some also predict a concurrent countertrend manifesting itself in **back-migration** from megacities to rural areas. The reason for this is seen in urban social crises and the fact that urban centres will increasingly fail to deliver on the promise of a better life due to crises in food, energy and water supply and problems related to sanitation.
- The experts are confident that the global trend of decreasing **birth rates and population growth** observed today will continue; however, this is expected to happen at a slower rate than envisaged by ongoing coordinated international efforts (MDGs). Furthermore, the **health of the rural population** is expected to improve significantly in the years to come, thanks also to new opportunities offered by improved medical capacities and treatment options such as **vaccination against HIV/AIDS.** However, it must be kept in mind that the majority of these trends are expected to become effective only after 2025.
- While the effects of operational **democratic decentralised government structures** were assessed to be highly beneficial for the situation of natural resources, the experts consider it less probable that such structures will be in place soon. Respondents placed particular emphasis on the 'true sense of ownership' that encourages people to invest into new and innovative approaches, which often arises from more decentralised structures. They assessed the chance of **institutional stability** materialising as limited; institutional stability, however, is a prerequisite for a profound **land reform** that could ensure more equitable access to land resources.
- More sustainable **consumption patterns** in developed countries could strongly influence the fate of natural resources. However, the experts do not expect this to materialise soon.

"Effective vaccination against HIV/AIDS will curb the erosion of people's capabilities through loss of skilled people."
Margret Ngigi

"There is growing recognition, even in highly centralised states, that climate change and natural resource responses demand multi-stakeholder interactions."
Janice Jiggins

Greater remuneration through better education

Population growth is expected to further level off in the years to come, which will have a positive overall impact on the poverty situation; however, positive effects will be partly offset by negative developments in urban centres. Improvements in the level of education will help to enhance productivity, which in many cases will make it possible to increase the level of remuneration.

Reduced pressure on natural resources

Reduced population growth in particular, but also continued migration from rural to urban areas will noticeably reduce pressure on natural resources. Moreover, a more distinct feeling of ownership, linked to more decentralised management structures, in combination with improved access to information on best practices, is expected to have a pronounced effect in achieving sustainable NRM. Meanwhile, increasing economic pressure to make the most of each square metre will partly offset these positive trends.

Improved health to ease food security problems

Improved health among the rural population will increase available labour at household level, which is expected to improve food security in rural areas. Changing consumption patterns in developed countries could have an important impact on food security in disadvantaged regions (production of staple food rather than animal feed for meat production); however, the likelihood that this will actually happen is considered low by the experts.

Economic trends

Change	Probability that change will materialise by 2025	Impact on poverty alleviation	Impact on natural resources
Commodity prices have increased tremendously	High probability	– –	–
New markets for environmental services are established (diverging assessment of probability)		+	+ (+)
New Green Deal has materialised (diverging assessment of probability)	Probable	+	+
Major investments in use of land and other resources by external actors have become dominant		–	– –
Oil price has increased by a factor of 5		– –	– (–)
Rural economies have diversified		+	+ +
Water and electricity services have been **privatised**		– (+)	– (+)
Global neo-liberal economy has recovered		– (+)	– (+)
Polluter-pays principle is being enforced (diverging assessment of probability)		+	+ (+)
Agricultural trade is completely liberalised	Low to very low probability	(+) –	– –

Key:

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– – *very negative;* – *negative*

( ) *diverging assessment by 2 or more experts*

n a *not assessed*

The results are not statistically significant.

"High commodity prices could push for overexploitation of resources, but will also create new forms of sustainable rural livelihoods."
Othmar Schwank

While experts' expectations differ considerably with regard to the shape of the future economic system, there is a consensus that major adaptations of the neo-liberal economic system will be inevitable. The experts anticipate that the economy will further diversify in the coming years as a direct consequence of the recent global incidents (resource scarcity and economic crises).

Overall, the assessments of trends and resulting implications for natural resources and the poverty situation in the economic field diverged far more than was the case for the other spheres of change. Possibly this divergence reflects the different backgrounds of the experts interviewed and their corresponding value systems. To some degree, the divergence might also be ascribed to the fact that the trends proposed for discussion in the economic sphere left more room for interpretation.

- There is little doubt that **commodity prices** will increase drastically in the years to come. This will be the case particularly for agricultural commodities and all forms of non-renewable energy. The experts consider probable that the oil price will have increased fivefold by 2025. Meanwhile, there is a slight chance that increased energy prices will lead to 'regionalisation' of production and consumption, creating a basis for sustainable rural livelihoods in the future.
- Some experts consider it highly probable that **new markets for environmental services** and market-oriented systems to financially compensate negative externalities will increasingly become established. It is expected that some form of a **New Green Deal** will materialise during the period

under consideration. By contrast, the experts were less confident about the **polluter-pays principle** being enforced soon. The assessment revealed an interesting difference in perception between experts from the North and experts from the South: the former generally ascribe a higher value to global compensation mechanisms, whereas the latter more often raised concerns about whether poor population segments would indeed benefit from the expected trickle-down effect of compensation mechanisms.

- The chance for recovery of the **global neo-liberal economy** is seen as very slim by the interviewed specialists. Based on recent attempts by governments to close off national markets in order to secure a higher level of influence vis-à-vis the economic crisis, the experts assume that **liberalisation of agricultural trade** will not continue in the coming years. Meanwhile, they anticipate that the trend towards **privatisation** of service provision in fields such as **water and electricity** will go on under the pressure of tight public finances. Major investments in land and other resources by external actors are expected to continue as well in light of the current economic conditions. Adapted economic strategies are expected to result in **diversification of rural economies.**

Increasing costs: burden and opportunity for the poor

The predicted considerable rise in prices for commodities is expected to have a negative overall impact on the poverty situation, especially because it will further restrict the livelihood options of low-income consumers. At the same time, high commodity prices and a tendency towards more domestic and regional commodity trade will provide new income opportunities. These could become a solid basis for sustainable rural livelihoods in the future. Although the establishment of mechanisms for compensating environmental services bears considerable difficulties, the experts nevertheless expect these instruments to become an important factor in poverty alleviation. The same goes for possible conclusion of a New Green Deal. The economic situation is expected to further improve as a result of the emerging diversification of rural economies, which will improve cash income opportunities for rural households and provide more economic support for rural commerce.

Mixed effects on natural resources

While increasing pressure to make more economic benefit out of limited resources will further increase pressure on remaining natural resources, possible readjustment of the global trade pattern offers a chance that trade systems might again become more regional and that services rendered by the ecosystem will gain in economic value, leading to disbursement of additional funds to sustain protection of the related natural resources.

Loss of traditional knowledge threatens food security

The increase in energy prices, above all, is expected to have a considerable impact on food security, since it will lead to a rise in the costs of both production and distribution of food. Some experts expect that investments in land by external players will improve the overall availability of food products. Loss of indigenous knowledge and traditional forms of land management is expected to place food security increasingly at risk in the long run. This trend might be partly compensated by greater diversification of rural economies, which will reduce risks associated with one-sided practices such as mono-cropping.

"Indigenous knowledge and traditional land management have been lost; this will jeopardise the food security of the poor."
Bao Huy

Differences from the 2005 assessment

The findings of the first two interview rounds in 2009 provide fairly strong arguments that there have been significant shifts in expected trends compared to the 2005 assessment. However, even though the experts discerned several promising trends – predominantly social developments – with implications for natural resources, these are not considered sufficient to halt or even reverse severe ecosystem degradation.

In 2005 experts already agreed that ongoing degradation of natural resources will be an important trend determining the situation of *Imagineland* in 2025. Now, in 2009, the growing significance of climate change hazards, as well as increasing energy scarcity – entailing deforestation and growing competition between biofuel and food production – are considered to be key trends with decisive negative impacts on poverty alleviation and natural resources.

"Subsistence farmers must be given incentives and capabilities to move to more profitable commercial farming, and agro-industry must have a good environment for private investment in rural areas. This would require a combination of appropriate policies (open trade regime, clear property rights in land and water resources, relatively low taxation of business) and public investments in rural areas (infrastructure, research, extension)."
John Nash, The World Bank,
InfoResources Trends 2005
www.inforesources.ch/pdf/trends_2005_e.pdf

The significance of small-scale farming for sustainable development in countries like *Imagineland* was assessed much more positively in 2009 than in 2005, when experts viewed it mainly as a source of increasing pressure on natural resources. Anticipation of new mechanisms, for example in climate change mitigation, seems to contribute to this more positive assessment – assuming that these mechanisms are adequately designed.

The probability that GMO crops will be widespread by 2025 is assessed much more critically by experts in 2009 than in 2005.

A democratic, decentralised government structure was perceived as one of the most powerful means to improve the natural resources situation – an appreciation that has not changed since the first assessment in 2005. However, despite considerable international efforts to foster more decentralised structures, the experts have become much more sceptical about the likelihood of further progress being made towards decentralisation. This assessment is particularly striking, given that almost no other element was considered to have an equally high positive impact on both the situation of natural resources and (rural) poverty alleviation. The same shift in the experts' perception has also taken place with regard to improved institutional stability and land reforms, which could guarantee more equitable access to land (also for women): the probability that this will materialise by 2025 was assessed as low to very low.

"Experimentation with institutional forms that are more hospitable to women and 'marginalised' groups; changes in bureaucratic culture towards being more responsive to feedback and more flexible rather than so directive."
Carol Colfer, CIFOR,
InfoResources Trends 2005
www.inforesources.ch/pdf/trends_2005_e.pdf

Compared to 2005, the experts see a higher probability in 2009 that markets for environmental services will be established in the coming years. This might be due to the fact that the pressure on natural resources is still increasing and compensation for sustainable management has gained more recognition in the past years as a way out of this vicious cycle. The key question remains whether the mechanisms will be developed to the benefit of the poor.

Need for reorientation in three dimensions

The experts' assessments of probable trends gave rise to the question of how policies and strategies need to be reoriented in order to reverse negative trends. Following the first two interview rounds, the InfoResources team thus developed three hypotheses on the direction this reorientation should take. In the third interview round, experts were asked to discuss these hypotheses and recommend adequate changes in policies at the international and national levels. In addition, they were asked to discuss implications for international cooperation.

Invest in developing decentralised accountable institutions

Hypothesis: *The only way to achieve sustainable natural resource management with positive effects on poverty alleviation and food security is to invest more efforts in fostering effective decentralised and democratic institutions.*

In view of the continued trend towards natural resources degradation, experts agreed that significant investments in developing effective institutions at multiple levels are essential in order to facilitate context-specific and coherent decision-making. However, they also think that this alone will not be sufficient. They identified an additional need for action towards development of appropriate technologies based on research, education and capacity building. Moreover, the experts placed particular emphasis on the need for reorientation of the financial framework. In doing so, they anticipated the content of the second hypothesis (see page 14).

Overall, the experts' responses highlight the importance of a nuanced understanding of 'decentralisation'. Although experts identified recent instances where democratic governments have successfully implemented pro-poor policies and thereby achieved greater political stability, decentralisation per se does not require a democratic system: non-democratic systems can accommodate decentralised innovations, decision-making adapted to local contexts and an architecture for accountable implementation of policies as well. More crucial preconditions for successful decentralisation are that decentralisation must include development of effective and accountable institutions, and that it must recognise people's property rights with regard to both physical assets (e.g. land) and intellectual property. As long as this is not the case, efforts towards decentralisation are vulnerable to being captured by elites, and there is a risk that majority rights will ignore minority interests.

These difficulties necessitate institutional analysis in order to reach sound governance conclusions.

International-level policies to foster decentralisation

Decentralisation efforts are promoted by international policies that recognise the rights of people and (indigenous) communities to capture the benefits generated by their resources, as well as through compensation mechanisms for environmental services. Depriving local people of their rights causes environmental externalities that jeopardise both social and political stability.

Accordingly, current intellectual property rights regimes that favour corporate control and obstruct pathways for local innovations need to be changed. This is particularly important in the context of adaptation to cli-

"I agree with the hypothesis, but have concerns: … the relationships between decentralised / democratic institutions and sustainable natural resource management is not uniform; local government can be captured; decentralisation requires resources that are then missing at the central level, and majority rule may neglect minorities…"
Joachim von Braun

"Unless the monetary processes that widen the poverty gap are checked, it will hardly be possible to foster democracy and decentralisation in a sustainable manner."
Othmar Schwank

"The essential points are the extent to which national political will to 'do something about' the situation can stimulate the development of multi-level adaptations that fit more localised contexts, and the extent to which central governments are willing to 'do something about' the market-based drivers."
Janice Jiggins

"Fair and open trade policy; control of corruption by investors from industrialised countries; codes of conduct that prevent exploitation of people who lack formal land, water and other property rights are needed."
Joachim von Braun

mate change, where local, decentralised innovations in crop varieties are ideally led by farmers themselves.
Experts identified several avenues for facilitating the reorientation proposed in the hypothesis. These include fostering the capacity of LDC delegations for effective advocacy at the international level, as well as enhancing civil-society participation in policy and research agenda-setting and assessments. This can be supported by policies promoting open access to and sharing of knowledge.
The WTO rules need to be reformed in such a way that externalities caused by production, manufacture and trade of natural resources based products are included in commodity prices and stakeholders can claim compensation when importing or exporting such products.

Supporting policies and measures at the national level
National governments need to place greater emphasis on domestic and regional trade rather than focusing solely on globalised trade. National policies on NRM should be more strongly driven by the objectives of securing livelihoods and reducing poverty. Perverse incentives at the national level, such as environmentally and socially harmful subsidies, need to be removed. Decision-making powers regarding utilisation of key resources such as oil and gas should be transferred to decentralised levels in a transparent manner, and the functioning of these bodies should be governed by national legal regulations.
These policies can only be successfully implemented if there are effective national institutions in place, with robust monitoring and reporting systems that measure progress towards sustainability, and if capacities in national-level governance functions are adequately enhanced. At the same time, awareness of the need for sustainable NRM must be raised among citizens, and they must be enabled to take on a stewardship role in conservation.
One expert points out that OECD countries should move towards a strategy for 'prosperity without growth', while national governments of developing countries should adopt 'sustainable growth' as their policy objective.

Regulate the economy for more sustainability

Hypothesis: *Economic growth under the conditions of a deregulated economy and a free market has failed to provide an adequate setting for sustainable development and sustainable natural resource management. Only regulation of the economy based on the principles of sustainability (e.g. the New Green Deal and new markets for environmental services) will be able to reorient economic development and foster sustainable natural resource management.*
In general, all experts agreed that the economy needs to be regulated based on principles of sustainability. However, opinions diverge with regard to the paradigm under which the necessary reorientation should take place. While one group promoted regulation under a free market system and avoiding over-regulation, the other group called for a more profound reorientation. This second group argued that growth of virtual financial markets was exponential in the past years and thus bore little relation to tangible resources. A very small proportion of people were able to benefit from these market dynamics, while the large majority of the poor have accumulated enormous debts; these need to be restructured in order to spur investments and productivity. Furthermore, experts recommended exploring the potential for creating solidarity-economy structures that are non-exclusive and non-speculative and are based on principles of sustainability.

"I agree, provided that this does not lead to protectionism that sends false market signals or potentially puts at risk the ability of small-scale farmers to link into sustainable international trade."
William Jackson

"However, we should note that such a scenario is heavily challenged by the dominant corporate actors and by governments who are only too happy to continue to 'hand over' the whole mess to the private sector. Any transition towards the scenario sketched above will come about, not because decision makers are not convinced by the evidence to which you refer, but because the currently dominant approaches are driving towards break-down."
Janice Jiggins

Towards policy recommendations

International-level policies to promote regulation of the economy

In line with the diverging perspectives outlined above, the policies recommended cover a broad spectrum as well. However, there seems to be consensus that new financial regulations should be free of perverse incentives and should integrate external environmental costs caused by unsustainable food production, manufacture and international trade into commodity prices (WTO reform needed). Compensation mechanisms for ecosystem services need to be designed to reward ecosystem management that preserves resilience, and they must be accessible also for small-scale farmers. One expert pointed out the potential of introducing an international Tobin tax (tax on trade of currency across borders).

Several experts emphasised the need for a change in behaviour and consumption patterns and for reducing international resource transfer to strengthen local economies. Both can be encouraged through education and a market system that punishes irresponsible consumption and wasting.

"Introduction of a Tobin tax will significantly reduce the attractiveness of speculation and trade in natural resources. It will correct the flaws in the design of current financial mechanisms that increase disparities between the rich and the poor."
Othmar Schwank

Policies at the national level to promote reorientation of the economy

National policies, both economic and on agriculture, must support greater efficiency in energy/resource use and promote green investments. Strategies that offer tangible benefits from environmental management to local communities must be promoted. Policies should strive for medium- to long-term outcomes rather than short-term achievements.

Dialogue based on knowledge and evidence should form the basis of decision-making. Decision-making processes should involve more ecologists at all levels of government in order to reduce the dominance of one single discipline (economics).

Local production networks, industrialisation geared to the needs of local agricultural production, energy-efficient technologies and fair and open trade policies need to become national economic policy goals.

Foster resource-efficient multi-functional land use

Hypothesis: *Small-scale farmers have the potential to implement resource-efficient land use, provided that they are protected from negative external influences and that there are enabling policies in place which in combination with price signals induced by shortages can trigger innovations.*

The experts agree that small-scale farmers have the potential to manage their natural resources in a resource-efficient way if the overall framework is adequate. However, adequate adaptation of this framework is heavily challenged by the interests of dominant international corporations as well as the difficulties faced by governments in coping with overwhelming development and environmental problems.

"The economic policy regulates production in order to determine that a certain percentage of the product supply comes from sustainable family agriculture."
Michelle Chauvet

Policies at the international level to support small-scale agriculture

Perverse incentives such as subsidies that harm farmers in developing countries must be abolished. Investment policies that enable rural communities to enter markets need to be promoted. International research partnerships between institutions in the North and in the South should be fostered in order to address knowledge gaps and provide decision support for policy-making and implementation. The international community must make financial investments in national reforms that encourage the evolution of a greener economy.

"International research partnerships have to be fostered much more again, as many countries – including the European Union – are more and more focusing on their own research agendas only, and no longer specifically support research on themes that are relevant for developing countries."
Hans Hurni

"[It is necessary to support development of policies both at international and national level that] fight against corruption, foster education of the poor, and invest in rural areas while keeping/conserving indigenous traditional cultural values."
Bao Huy

Policies at the national level to strengthen local communities

Ensuring access to sufficient and healthy food as a human right, strengthening efforts to improve the situation of women and children, and development of alternative food crops in the context of climate change are measures proposed by the experts. Other recommendations include promotion of investments in small-scale farming in order to increase agricultural productivity, be it with or without GMOs, as well as development of innovative and effective market mechanisms that address the problems of small production quantities. However, the experts expressed great scepticism with regard to these ideas actually being implemented. Experts also identified a greater need for national-level interventions in the domestic sphere, such as ensuring protection of small farmers' rights to water resources, rather than solely protecting them from external influences.

The role of international cooperation

Support for policy reorientation

The experts see an important role for international cooperation in fostering effective, accountable and decentralised institutions, promoting sustainability-oriented regulation of the economy and supporting resource-efficient and multi-functional small-scale farming by strengthening civil society, in particular poor and indigenous people and women. In addition, international cooperation efforts should address corruption and inefficiency in governmental structures. Learning processes and capacity building to empower committed civil-society organisations, promotion of open access to and sharing of knowledge with a view to more transparency, and support of research for evidence-based decision-making are considered crucial elements in striving for these goals.

International cooperation and multilateral efforts

All initiatives listed in the table were considered to bear a potential for contributing to sustainable development, and there were only slight changes compared to the 2005 assessment. Experts still assessed capacity building and empowerment of delegations of LDCs in UN-related and other international bodies for policy dialogue as most promising with regard to promoting sustainable NRM and poverty alleviation in LDCs.

Addressing the post-MDG situation

Natural resources were not sufficiently considered in the MDGs and need to be specifically addressed in future frameworks. Experts felt that the MDGs gave an important stimulus to thinking, but in practice could not leverage the necessary funding or the will to implement efforts. Some felt that the world will be a different place by 2015: while the MDGs were largely based on a 'catch-up' philosophy and sought to address the demands of the past, these will increasingly be outweighed by the challenges of the future. New economic powers such as the 'BRIC' cluster of nations (Brazil, Russia, India and China) could have a larger say in international matters than those who conceptualised and pushed the MDGs. This may lead to new trends that are hard to predict at present.

Significance of Paris Declaration with regard to NRM

The impact of the Paris Declaration on Aid Effectiveness on NRM should not be assessed without addressing existing concerns that it has inhibited innovation and diversification of approaches and has failed to ensure the necessary funding for stopping environmental degradation. The influence of donor agencies on international and national policies is declining with the emergence of new economic powers (e.g. BRIC) and the related global movement of vast sums of private-sector investment funds.

Other emerging changes in international cooperation

Policies and investments related to climate change bear a potential for substantially altering the role of development assistance. A sound code of conduct is needed to prevent further 'land grab', which has partially been caused by increasing demand for biofuel; moreover, a virtual stock of food

Initiatives by international cooperation to promote sustainble natural resource management and poverty alleviation

Most promising to promising initiatives; assessed in 2005	***2009***
Capacity building *and empowerment of delegations of least developed countries*	↘
Reduce contradictory policies *between WTO agreements and environmental conventions by developing social ecological standards for trade*	→
Improve coherence *of environmental conventions and multilateral agreements*	→
Foster ***implementation*** *of conventions and multilateral agreements*	↘
Foster research on institutional innovation in order to mitigate natural resource degradation *and advance poverty alleviation*	↗

The direction of the arrows indicates how the experts' assessment changed compared to the 2005 assessment:

→ *Slightly less promising than in 2005*

↗ *Slightly more promising than in 2005*

"[We need] to think in a new world order with new rules in all areas."
Michelle Chauvet

grains needs to be created. This might be addressed by new global initiatives for substituting fossil fuels and ensuring food security.
There was a feeling among experts that the world desperately needs new forms of governance for global problems. However, in view of the existing deep structural inequalities, the experts also felt that this may not come without a long and difficult effort to increase public trust and the political will to move towards a more sustainable world.

Seize the opportunity of a turnaround

The unanimous signal conveyed by the eight international experts consulted for this assessment is alarming: The degradation of natural resources is progressing and will reach a point by 2025 where livelihoods in LDCs will be significantly threatened and an increasing number of agro-ecosystems will lose their capacity to deliver important services. Expected positive social trends – i.e. improvement of health, decrease of birth rate, and increase of primary school enrolment – will not suffice as leverage to reverse the degradation of natural resources and thus alleviate poverty and hunger.

However, the present reassessment clearly reveals that a change in thinking and a shift in paradigms have begun to take place, sparked by the energy and food price crises and the recent financial turmoil, but also due to alarming scientific findings such as those reported by the IPCC and in the Millennium Ecosystem Assessments.

A turnaround can only succeed if the emerging awareness of the need to reorient policy-making and the economy is followed by concrete action. It will be crucial that policies and institutions regain regulating power over greedy economic forces in an accountable manner in order to be in a position to mitigate ecosystem degradation and alleviate poverty.

- Achievement of this goal depends on whether we succeed in the near future in developing a global governance institution that is based on principles of sustainability, balances out inequality, grants more influence to developing countries, and recognises the responsibility of developed countries. We are hopefully at a turnaround where political responsibility is about to regain regulating power over the economy in a democratic way. Much will depend on the outcome of the UNFCCC COP 15 in Copenhagen, which can possibly serve as a frame of reference for similar structures focusing on sustainable land use.
- Reorienting the economic framework based on principles of sustainability towards reflecting real social and environmental values and costs will be decisive in developing effective, decentralised and accountable institutions.
- National accountable governments, with the support of international cooperation, still need to secure progress in improving education and health of their poor population, especially of women.
- A focus needs to be placed on redefining a framework for sustainable development in small-scale farming. Considered in the 2005 assessment as a source of pressure on natural resources, small-scale farming is now recognised as a key to implementing resource-efficient and multi-functional land use in LDCs. This implies capacity development among women and men, sharing of traditional and scientific knowledge, recognising people's tenure and intellectual property rights – not only in terms of access rights but also as human rights – and taking advantage of new technologies. Accessibility of infrastructure has to be improved, and compensation mechanisms must be accessible to small-scale farmers. This calls for rediversion of financial support of agriculture development from the North to the South.

Today we must relate our actions to ethical values. Our orientation must be based on scientific as well as normative arguments and knowledge.

"We do need measures that foster mankind's ability to act in the collective interest in times of increasing threat – but it is hard to see this emerging spontaneously under prevailing ideologies that promote individualism and competition, and wealth accumulation before or over a decent life for all."
Janice Jiggins

Methodology

Purpose of InfoResources Trends

Policy- and decision-makers in the sphere of natural resources governance face the need to anticipate future developments in order to develop mid-term visions and mid-term policies, as their decisions may also have long-term impacts. However, urgent short-term matters often dominate decision-making. By assessing the likeliness of certain changes not only in the natural environment and in land use but also in the social and economic context at country level, the present assessment strives to inform the policy- and decision-making community about future challenges.

Conceptual basis

The methodology of this assessment of trends is based on three main conceptual ideas:

- ***Rely on the expertise of several specialists:*** Taking up certain notions of the Delphi method, the assessment was based on the expertise of several carefully selected experts. Criteria for selection were the following: broad range of thematic coverage related to NRM; different geographical backgrounds bringing together perspectives from South and North; to some degree, gender balance (see Experts' profiles, Annex II, page 21).
- ***Common point of reference:*** The concept of a fictive country representing a typical least developed country served as a common point of reference (see Annex IV, page 23). This helped to prevent the discussion from focusing too closely on regional and context-specific particularities. However, this approach may bear the risk of neglecting certain important factors that might be decisive for development in specific individual countries.
- ***Reconsider and adapt previous assessments:*** Analyses of the future are always subject to uncertainties. They can never be true, but they can provide indications regarding probable trends. It is therefore necessary to adapt and re-evaluate previous assessments and develop them further based on the integration of emerging and different perspectives.

The Survey

The panel of 8 experts answered questionnaires in three subsequent interview rounds. After each round, answers where analysed by the InfoResources team to subsequently design the next questionnaire. The survey was conducted by e-mail, each questionnaire requiring 1–2 hours to be completed. By contrast with the original Delphi method, the InfoResources team did not act as a neutral facilitator but took on a navigating and interpreting role and was thus not value-free. Each round was not exclusively based on the results of the previous round but also included additional aspects considered relevant by the InfoResources team.

- ***Round 1 – Probability of changes:*** Based on its own studies and knowledge, the InfoResources team identified major and subtle changes, including the ones assessed in 2005, that might materialise by 2025. These potential changes covered the following dimensions: natural environment, land use, social development, and the economy. The experts were then asked to categorise the changes in four probability classes (very high probability, probable, low probability and very low probability) and provide arguments explaining their classification. In addition, they were invited to complement the list of potential changes.

- ***Round 2 – Impact of changes:*** The InfoResources team arranged the potential changes according to their probability as assessed by the experts. Subsequently, the experts were asked to assess the impact of each potential change on poverty alleviation and natural resources and to comment on its significance for food security. The impact categories were: very positive; positive; negative; very negative.

- ***Round 3 – Towards policy recommendations:*** Based on the results of the first two rounds, the InfoResources team developed three hypotheses on how to reorient policies in order to reverse the negative impacts identified by the experts. The experts were asked to either agree with these hypotheses or develop alternative pathways. Based on their judgment, they provided policy recommendations for the international and national levels and drew conclusions regarding the role of international cooperation.

Experts' profiles

Experts	Focus	Institution
Michelle Chauvet Professor of Rural Sociology; author of IAASTD Latin America and Caribbean Report	Socio-economic impacts of biotechnology in agriculture; livestock; globalisation in these fields	Department of Sociology, Universidad Autónoma Metropolitana (UAM), México www.uam.mx
Hans Hurni * Director, CDE; Director, NCCR North-South; Chairman, EFARD; lead author of IAASTD Global Report	Integrated and sustainable natural resource management	Centre for Development and Environment (CDE), Institute of Geography, University of Bern, Switzerland www.cde.unibe.ch
Bao Huy Head of Department of Forest Resources and Environment Management; Chair, Vietnam Network for Agroforestry Education (VNAE)	Forest management planning; community forest management	Tay Nguyen University, Vietnam www.socialforestry.org.vn
William (Bill) J. Jackson * Deputy Director General, IUCN	Biodiversity; forest management; rural development and conservation	International Union for Conservation of Nature (IUCN), Gland, Switzerland www.iucn.org
Margaret E. Ngigi Lecturer, Department of Agricultural Economics and Agribusiness Management, Egerton University	Agricultural economics; economic institutions; poverty analysis	Department of Agricultural Economics and Agribusiness Management, Egerton University, Kenya www.egerton.ac.ke
Janice Jiggins Social scientist, working for leading bilateral and multilateral international development agencies in Africa and South Asia; author of IAASTD reports	Agriculture and food systems research and development; sustainable resource management; gender issues	Visiting researcher at Wageningen University, The Netherlands www.wageningenuniversiteit.nl/UK
Othmar Schwank * Member of Management Team, INFRAS; UNFCCC Expert (2000–2007); Advisor to GEF, World Bank, and Swiss Government	Energy; climate adaptation; experiences in implementation of UN conventions; environmental management and natural resource policies; technology transfer	INFRAS, Consulting, Policy Analysis and Research, Zurich, Switzerland www.infras.ch/e
Joachim von Braun * Director, IFPRI; President, International Academy of Agricultural Economists (IAAE)	Food security; projections, e.g. Africa 2020; poverty and globalisation	International Food Policy Research Institute (IFPRI), Washington www.ifpri.org

** expert participated already in the first trends assessment in 2005*

Further reading: Selected publications authored by the experts

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- McIntyre, B.D., Herren, H.R., Wakhungu, J. and Watson, R.T. (eds.). 2009. *Agriculture at a Crossroads.* Washington, D.C.: The Island Press. www.agassessment.or

- von Braun, J. 2008. *Food and Financial Crises – Implications for Agriculture and the Poor.* Washington, D.C.: IFPRI Food Policy Report.

Imagineland: Key statistical data

The fictive country named *Imagineland* was designed in 2005 to represent an average least developed country. The 2009 assessment was based on the same construct, which served as a point of reference and helped to guarantee a certain degree of coherence and comparability between the two assessments.

General data

- Low-income country
- Territory: 200,000 sq km
- Total population: 20 million; 60% aged between 15 and 64
- Population density: 100 inhabitants per sq km
- Urban population: 40% of total population; 3 million live in the capital city
- Employment by sector: agriculture – 60%; small-scale industry, mining, agro-industry and construction – 15%; services and administration – 25%
- Gross domestic product (GDP): USD 30 billion; GDP composition by sector: 35 % agricultural, 25% industry, 40% services
- Democratic system, decentralisation process started a few years ago
- No open conflict
- The three Rio conventions have been ratified

Services and infrastructure

- Administration: rather heavily centralised administration in the capital and recently established administrative centres in district capitals
- Education: secondary school mainly in rural centres, two main universities
- Hospitals in district capitals, 1 primary health centre per 35,000 inhabitants, national public information campaign on HIV/AIDS
- Transportation: paved highways linking the main rural urban centres (5,000 km) and 30,000 km of unpaved rural roads
- Water and sanitation: 70% of population have access to improved water sources, 25% have access to sanitation

Energy

- Electricity production: 30 billion kWh; concentration in rural urban centres with 65% of the households connected; only few villages connected in rural areas
- Gas production: 60 million m3, for domestic consumption
- Oil: no production; consumption of 40,000 barrels/day

Communication and information

- General dissemination of information mostly through radio broadcasting; about 20% of the population owns a radio receiver; less than 1% owns a television set
- Telephone systems are still rudimentary, but expanding; about 500,000 main lines and 1 million mobile phones in use

Data on rural areas

Natural resources

- Subtropical climate, rainfall between 600 and 1500 mm, 2 rainy seasons, 5–7 dry months
- 30% of the area are mountainous and 40% hilly
- The main rivers have their sources in the hilly and mountainous areas; some of them dry up towards the end of the dry season
- Soils: few fertile volcanic soils, mainly tropical soils sensitive to human activities
- Forests: 20% of the area, out of which 40% are secondary forests, 10% plantations and 20% protected areas; deforestation rate of 1% between 1990 and 2000
- Arable land and permanent crops: 15% of the country; grasslands: 20%
- Land quality: 23% degraded by erosion, leaching and inadequate application of fertilisers, to the point that production is affected
- Moderate but increasing pollution; environmental sustainability index (ESI) of about 50, i.e. the worldwide average
- Water availability: 5,000 m^3/capita
- Biodiversity: 5% of territory is under protection, 100 higher plant species are threatened

Society

- Average population density in rural areas: about 60 inhabitants per sq km
- Demographic growth of 2%
- 35% of the households live on less than 1 USD a day in rural areas, 28% countrywide
- Up to 8% of the farmers are landless
- Frequent causes of adult mortality are malaria and AIDS; infant mortality is about 50 deaths per 1000 live births
- 65% of the girls and 85% of the boys are enrolled in primary schools
- Female/male ratio in rural areas is 53/47

Farming systems

- Arable land per capita: around 0.15 ha (6–7 inhabitants per ha of arable land and permanent crops)
- Intensive and frequently irrigated agriculture around urban centres and in the alluvial plain, cash-crop production for export (about 20% of the arable land)
- Medium- and small-scale agriculture, mainly subsistence agriculture in the hilly regions (60% of arable land)
- Shifting cultivation in the mountains
- Small-scale livestock farming for subsistence

Rural household economy

- Energy source: biomass (wood fuel), oil/petroleum (transportation, lighting)
- Cash-crop commercialisation contributes to 50% of rural incomes
- Remittances income from emigrants: 5%

InfoResources services will cease at the end of 2009

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