

## **INDICATOR LIST**

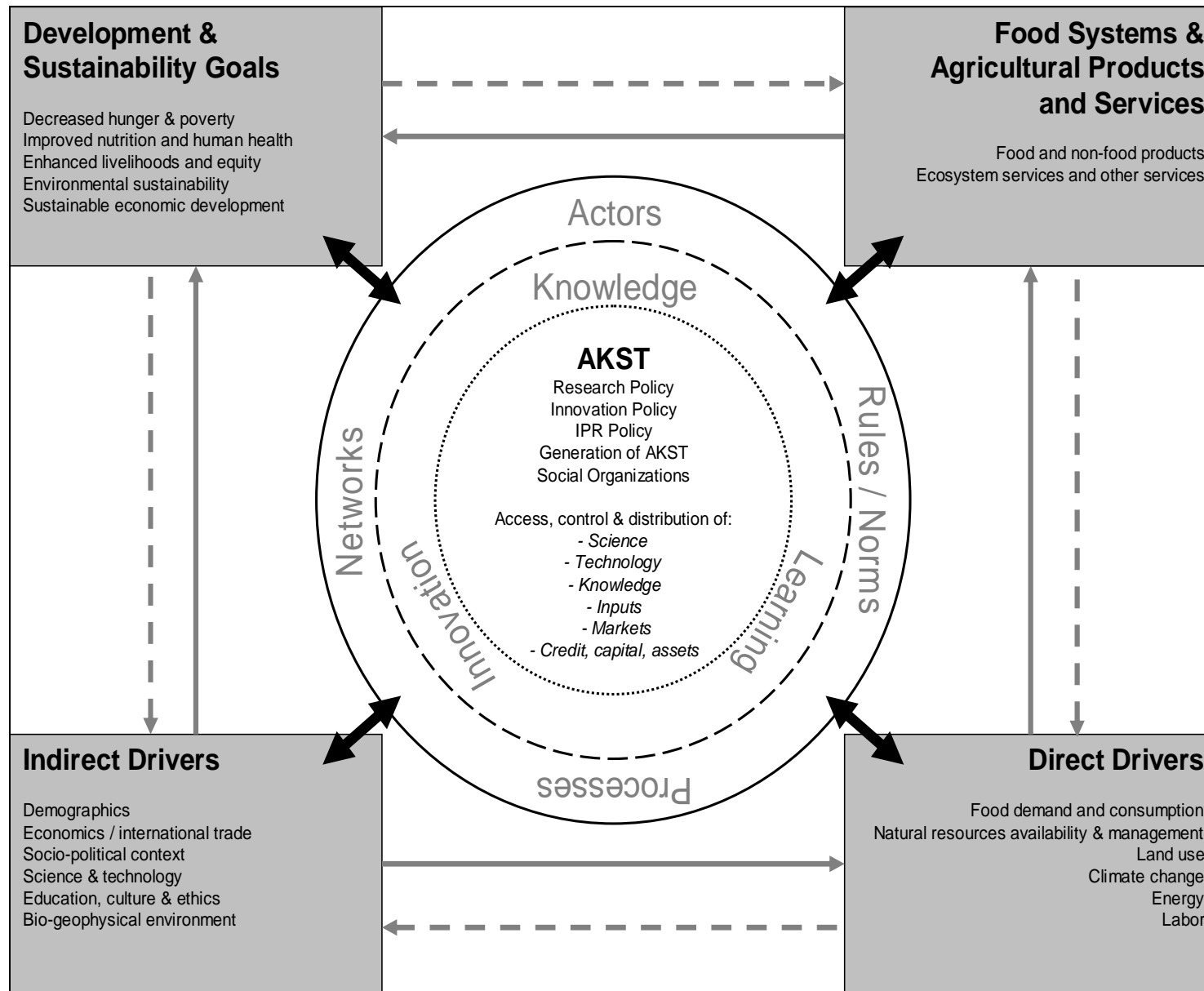
### **International Assessment of Agricultural Science and Technology for Development**

#### **Second-order Draft – not for citation**

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#### Comments by CLAs:

- This draft is a compilation of currently available indicators, grouped along the new draft conceptual framework of the IAASTD. This indicator list is a draft that is still rather incomplete, and furthermore, many references are missing.
- Any modifications and amendments are highly welcome. Please write your feedback and your impressions and forward any comments [iaastdreview@worldbank.org](mailto:iaastdreview@worldbank.org)
- Chapter 1 of the Global Assessment will include a section on indicators, principles, and a critique of currently available and used indicators.



## Development and Sustainability Goals

Indicator area (Based on new draft conceptual framework of IAASTD)	Indicators	Target Description
<b>Decreased Hunger and Poverty</b>	<ol style="list-style-type: none"> <li>1. % pop. below minimum level of dietary energy consumption (MDG/FAO) 122 c; 1980-01</li> <li>2. The population below \$1 purchasing power parity per day (MDG/WDI) 99 c; 1979-03</li> <li>3. HDI</li> <li>4. GINI</li> <li>5. FAOstat nutrition(1985-2004) <ul style="list-style-type: none"> <li>• Food production index/index per capita (also: WR report 2005)</li> <li>• Livestock production index (WR Report 2005, p.221, 1983-2003)</li> <li>• Fish catch/landings and freshwater production (Fao Aquastat)</li> </ul> </li> </ol>	Indicators shall highlight the <b>production aspects</b> of agricultural development and issues of <b>access and entitlement</b> .
<b>Nutrition and Human Health</b>	<ol style="list-style-type: none"> <li>1. Total calorie supply (FAO 1961 2002)</li> <li>2. % pop. below minimum level of dietary energy consumption (MDG/FAO) 122 c; 1980-01</li> <li>3. Prevalence of underweight children under 5 years of age (MDG/UNICEF-WHO) severe cases – 123 c; 1981-03, all cases – 141 c; 1976-03</li> <li>4. Incidence of overweight and obesity within countries (source to be identified, probably WHO website)</li> <li>5. Proportion of population with improved sanitation, rural and urban (MDG/UNICEF-WHO)188 c; 1990-02</li> <li>6. Proportion of population (urban/rural) with improved drinking water (MDG/UNICEF-WHO)188 c; 1990-02</li> <li>7. Human poverty index –2 (%) (HDR)</li> <li>8. Public health expenditure as %GDP (ID 82)</li> <li>9. Under-5 mortality rate (MDG/UNICEF-WHO), 196 c; 1960-03</li> <li>10. Healthy life expectancy at birth (<a href="http://www3.who.int/whosis/core/core_select.cfm">http://www3.who.int/whosis/core/core_select.cfm</a>)</li> <li>11. Average life expectancy at birth (suggested by Ana and Kris) Source: <a href="http://www3.who.int/whosis/core/core_select.cfm">http://www3.who.int/whosis/core/core_select.cfm</a>)</li> <li>12. Food aid cereals received by country (FAO, WRI)</li> <li>13. Emissions of organic water pollutants (BOD) total, Data Sets Nation / World 1980-1999, updated 2003, In: <a href="http://geodata.grid.unep.ch/results.php">http://geodata.grid.unep.ch/results.php</a></li> <li>14. Limited data source for 2000-2004 on pesticide sales by company available at: <a href="http://www.organicconsumers.org/foodsafety/biotechpesticides080805.cfm">http://www.organicconsumers.org/foodsafety/biotechpesticides080805.cfm</a> And better data at:</li> </ol>	<p>Indicators shall make the link to the production aspects of agricultural development by showing the <b>total calorie supply</b>.</p> <p><b>Spatial differences</b> in calorie access is highlighted by indicator 4</p> <p>Health related indicators highlight the number of <b>children disadvantaged</b> by underweight at an early age because it is assumed that the effects of this stunted development will carry on into adulthood.</p> <p><b>Indicators 5 and 6</b> show two very effective entry points to reduce human loss.</p> <p>Specific health related indicators (13 and 14) highlight important <b>health links to agricultural development</b></p>

	<p><a href="http://www.pan-uk.org/pestnews/pn68/pn68p9.htm">http://www.pan-uk.org/pestnews/pn68/pn68p9.htm</a></p> <p><b>Should have:</b></p> <ul style="list-style-type: none"> <li>• Working conditions in agriculture</li> <li>• Level of accidents, illness</li> <li>• Occupational deaths</li> <li>• Pesticide poisoning / pesticide sales</li> <li>• Rural workers (Number, conditions (ILO))</li> <li>• Migratory workers</li> <li>• Child labor in agriculture</li> </ul>	
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<b>Sustainable economic development</b>	<ol style="list-style-type: none"> <li>Gross National Income PPP (purchasing power parity) /per capita (World Bank)</li> <li>Gross capital formation in % of GDP (World Bank)</li> <li>Adjusted net savings (World Bank)</li> </ol> <p><b>Should have:</b> More complete measures of external costs of environmental and social costs associated with economic activities</p>	<p><b>Indicators</b> will indicate broad trends in economic development. Net adjusted savings gives account also of investments in education and depreciation of natural capital.</p>
<b>Enhanced Livelihood &amp; Equity</b>	<p><b>Income</b></p> <ol style="list-style-type: none"> <li>The population living below \$1 per day (ppp) (MDG/WDI) 99 c; 1979-03</li> <li>Agricultural value added (% of GDP/annual growth %) WDI, 167 c; 1960-02</li> <li>Agricultural productivity - % increase (WDI)</li> <li>Agricultural employment (% of labor force (women, men) - (WDI/FAO/ILO), 185 c; 1980-04</li> <li><b>Should have:</b> data / estimates for the informal agric. employment sector</li> </ol> <p><b>Resources</b></p> <ol style="list-style-type: none"> <li>Groundwater withdrawal as % of annual recharge (indicator ID 3679)</li> <li>Water dependency ratio (use/resources), FAO/AQUASTAT</li> <li>Internal renewable water resources (indicator ID 3411), short time series only available</li> <li>NOAA/GVI vegetation index, annual maximum, 1982-1994 (GRID database, data/biosphere GNV23)</li> </ol> <p><b>Should have:</b> more data on soil cover, erosion risk</p> <p>Major soil constraints and land degradation severity (<a href="http://www.fao.org/ag/aql/agll/terrastat/#terrastatdb">http://www.fao.org/ag/aql/agll/terrastat/#terrastatdb</a> and World Soil Resources Reports 90, <a href="ftp://ftp.fao.org/aql/agll/docs/wsr.pdf">ftp://ftp.fao.org/aql/agll/docs/wsr.pdf</a>)</p> <p><b>Equity</b></p> <ol style="list-style-type: none"> <li>Share of income or consumption 2001 – 2005 (HD reports 2001- 2005, earlier ?)</li> <li>Female Adult literacy rate</li> <li>Access to health care, water &amp; sanitation (same as above)</li> <li>GINI index</li> <li>Gender related development index (HDR)</li> <li>Gender empowerment measure (HDR)</li> <li>Status of child labour 1999 – 2003 (<a href="http://www.unicef.org/statistics/index_24287.html">http://www.unicef.org/statistics/index_24287.html</a>)</li> <li>% of primary school entrants reaching grade 5 (1974 – 2004) (<a href="http://www.unicef.org/statistics/index_24287.html">http://www.unicef.org/statistics/index_24287.html</a>)</li> <li>Corruption perception index (World resources 2002 table 1, World resources 2005, table 6)</li> <li>No. of NGOs, data for 1990-2000 (World Resources 2002-04)</li> </ol>	<p><b>Income:</b> Indicators suggested shall highlight the <b>quantitative element</b> of income.</p> <p>Apart from this <b>agricultural productivity</b> is considered important as it is expected that future income in agriculture will not be based on continued resource consumption but on increased agric. productivity.</p> <p><b>Resources:</b> The availability of water for agriculture highlight important quantitative aspects of <b>access to resources</b> (indicator1-3)</p> <p><b>Equity aspects</b> highlight important areas that need to be looked at in order to increase the application of science and technology in the development process:</p> <ul style="list-style-type: none"> <li>Gender (2,6,7,)</li> <li>Access to basic services (3, 9, 10)</li> <li>Education (2, 8, 9)</li> </ul>

Environmental Sustainability	<ol style="list-style-type: none"> <li>1. Ecological footprint (<a href="http://www.footprintnetwork.org/gfn_sub.php?content=footprint_overview">http://www.footprintnetwork.org/gfn_sub.php?content=footprint_overview</a>)</li> <li>2. Environmental Sustainability Index (ESI) (<a href="http://www.yale.edu/esi/ESI2005.pdf">http://www.yale.edu/esi/ESI2005.pdf</a>, only 2005 data but good for country comparison) or: Environmental Performance Index (EPI) 2006 (<a href="http://www.yale.edu/epi/">http://www.yale.edu/epi/</a>)</li> </ol>	<p>Indicators to highlight ecological functionality. Indicators suggested are very general and highly aggregated but the <b>multiplicity and the spatial dispersion of environmental functions</b> important to agriculture do not allow to limit the selection of indicators to theme-specific indicators for certain location only.</p>
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## Drivers

Indicator area (based on new draft conceptual framework of IAASTD)	Indicators	Remarks
Indirect drivers	<p><b>Indirect drivers</b></p> <p><b>Economic</b></p> <ol style="list-style-type: none"> <li>1. World market prices for key agricultural commodities</li> <li>2. Demand for agricultural products (same commodities as under: see: 'Physical Capital – Production')</li> <li>3. Agricultural subsidies-support estimates for OECD countries as % of their GDP</li> <li>4. Average tariffs imposed on agricultural products</li> <li>5. Terms of trade (HDR 2005, table 16)</li> <li>6. Technology diffusion and creation (tel. mainlines, cell users, internet users), Human dev. Report 2005, table 13</li> </ol> <p><b>Demographic</b></p> <ol style="list-style-type: none"> <li>1. Labor force in agriculture (ILO)</li> <li>2. % share of women on agricultural labor force (ILO, Laborsta)</li> <li>3. Population growth (WDI UN estimates)</li> </ol> <p><b>Should have:</b> informal agric. employment</p> <p><b>Socio-political</b></p> <ol style="list-style-type: none"> <li>1. Food Aid – cereals received by country</li> <li>2. GINI index of concentration of land tenure (<a href="http://www.fao.org/es/ess/census/wcares/default.asp">http://www.fao.org/es/ess/census/wcares/default.asp</a>)</li> </ol> <p><b>Should have</b></p> <ul style="list-style-type: none"> <li>• victims of crime (proxy for socio – political security)</li> <li>• years of productive life lost due to ill health</li> </ul>	<p>Indicators of <b>indirect economic drivers</b> shall highlight the broader economic conditions that govern the uptake and utilisation of agric. technology.</p> <p>Indicators of <b>demographic drivers</b> highlight the labor force available to the agric. sector on the one hand and the population growth that challenges agric. production on the other hand. Indicator 3 specifically highlights the role of women in agriculture implying their importance as collaborators in technology development</p> <p>The socio political drivers suggested are meant to indicate the context of innovation and risk preparedness within which innovative agric. technology is applied. This context is thought to be counterproductive if a country or a region depends to a high level from food aid and if production factors are unequally distributed.</p>

<b>Direct Drivers</b>	<p><b>Direct drivers</b></p> <p><b>Economic</b></p> <ol style="list-style-type: none"> <li>1. Food consumption (FAOstat)</li> <li>2. Arable and permanent cropland (World Resources 2005)</li> <li>3. Trends in the use of cereals as feed 1982 – 1994 (FAO: Food, Agriculture and the Environment Discussion Paper 28, Livestock to 2020, Rome 1999) (regular update by FAO)</li> <li>4. % of potentially arable land actually used (FAO Terrastat) (<a href="http://www.fao.org/ag/agl/agll/prtsoil.stm">http://www.fao.org/ag/agl/agll/prtsoil.stm</a>)</li> <li>5. Yield or productivity per hectare and per worker</li> <li>6. Women workload in agric.</li> <li>7. Access to extension services (Swanson, 1990)</li> </ol> <p><b>Should have:</b></p> <ul style="list-style-type: none"> <li>• Changes in land use and land cover</li> <li>• Climate change and air / water pollution</li> </ul> <p><b>Demographic</b></p> <ol style="list-style-type: none"> <li>1. Value addition from agric. as % of GDP (FAO)</li> <li>2. Economically active agricultural population as ration of total pop (FAO)</li> <li>3. Agricultural Population as % of total population (FAO)</li> </ol> <p><b>Availability and Management of Natural Resources</b></p> <ol style="list-style-type: none"> <li>1. Refer to table on 'environmental sustainability'</li> </ol>	<p><b>Economic indicators</b> of direct drivers focus on food consumption patterns and the available land for production. Productivity increases are expected to be able to bridge increasing gaps between indicators 1 and 2.</p> <p>The access to extension service indicates a bottleneck path for science and technology towards application</p> <p><b>Demographic indicators</b> highlight the productivity of agric operations (1 and 2) on the one hand and the burden that rests on this productivity on the other hand (2)</p> <p>Indicators of the availability of <b>natural resources</b> highlight qualitative and quantitative aspects of the functionality of the NR base on which agric. dev. depends.</p>
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**Agricultural Outputs and Services**

<b>Indicator area</b> (based on new draft conceptual framework of IAASTD)	<b>Indicators</b> (should indicate how well AKST contributes to achieving the outputs and services indicated)	<b>Remarks</b>
<b>Biomass, Livestock, Fish, Crop production</b>	<ol style="list-style-type: none"> <li>1. Area of agricultural land (includes arable land, permanent crops, permanent pasture - 1000 ha/ha per person/% of total land area (FAO), 206 c; 1961-05</li> <li>2. Nice to have: data on land cover by biomass</li> <li>3. Production timelines: <ul style="list-style-type: none"> <li>• FAO Stat. Crop production</li> <li>• FAO Stat. Fish catch / production</li> <li>• FAO, GLIPHA Livestock Production</li> </ul> </li> </ol>	Indicate production potential (1) and production (3)
<b>Forestry for Food</b>	<ol style="list-style-type: none"> <li>1. Forest products (FAO 1961-05) ( FORIS 1990-98)</li> </ol> <p><b>Should have:</b></p> <ol style="list-style-type: none"> <li>1. Data/estimates for Non Timber Forest Products (NTFP)</li> </ol>	Indicate production
<b>Fibre</b>	<ol style="list-style-type: none"> <li>1. Production timelines: FAO Stat. Crop production</li> </ol>	Indicate production
<b>Carbon Sequestration</b>	<ol style="list-style-type: none"> <li>1. Total carbon stored in forests (tons) -  <a href="http://www.heinzctr.org/ecosystems/forest_technotes/forest_carbon_strg.shtml">http://www.heinzctr.org/ecosystems/forest_technotes/forest_carbon_strg.shtml</a>  <a href="http://unisci.com/stories/20014/1212012.htm">http://unisci.com/stories/20014/1212012.htm</a> </li> </ol> <p><b>Should have:</b></p> <ol style="list-style-type: none"> <li>1. Carbon balance for intensive and extensive agric. areas</li> </ol>	
<b>Energy</b>	<ol style="list-style-type: none"> <li>1. Energy consumption from biomass (biogas and liquid biogas/solid biomass, including wood) – WRI-IEA (1960-01 for OECD, 1971-01 for non-OECD) – reliable data</li> <li>2. Should have: input / output relation for energy for various agricultural systems</li> </ol>	Indicate energy intensity of various agric. production systems. <b>Energy intensity</b> to act as a guideline for technology development in agric.
<b>Ecosystem services</b>	<p>Refer to indicators in: 'Environmental Sustainability' under: <i>Development and Sustainability Goals</i></p> <p><b>Should have:</b></p> <ol style="list-style-type: none"> <li>1. Data on agro-ecological biodiversity (both in-situ and ex-situ)</li> </ol>	Should indicate on ecosystem functionality as a basis for agric. production.

## AKST Systems

Indicator area (based on new draft conceptual framework of IAASTD)	Indicators (should indicate how well established and future AKST systems contribute to the development and dissemination of AKST)	Remarks
<b>Research / Innovation policies</b>	<ol style="list-style-type: none"> <li>1. Agricultural Research Intensity Ratios (Research expenditures expressed as a percent of agricultural gross domestic product) <a href="http://www.ifpri.org/2020/briefs/number24.htm">http://www.ifpri.org/2020/briefs/number24.htm</a></li> <li>2. Researcher in R&amp;D (Human Dev. Report 2005, p. 262 f)</li> <li>3. Patents granted to residents (Human Dev. Report 2005, p. 262 f)</li> </ol> <p><b>Should have:</b></p> <ol style="list-style-type: none"> <li>1. A measure for farmer led research / technology development efforts (possibly only to be developed from scattered data, supported by expert opinion)</li> </ol>	Indicate the intensity of conventional research efforts in terms of financial input (1), human input (2) and results (3). However, data for the agricultural sector are scarce and difficult to interpret.
<b>Local and institutional setting of AKST</b>	<ol style="list-style-type: none"> <li>1. Number and funding of CGIAR and National Agricultural Research Organizations (websites)</li> <li>2. Indicators on communication and media (Least Developed Countries report, 2002)</li> <li>3. Indicators on Transport and Transportation Network (Least Developed Countries report, 2002)</li> </ol>	Indicate density of research organizations and the quality of the infrastructural context within which research takes place.
<b>Social organisation</b>	<ol style="list-style-type: none"> <li>1. No. of NGOs, data for 1990-2000 (World Resources 2002-04)</li> </ol> <p><b>Should have:</b></p> <ol style="list-style-type: none"> <li>1. No of agricultural NGO's</li> <li>2. A measure for the effectiveness of these and other types of civil society organization</li> </ol>	
<b>Generate, disseminate, Access, adopt/use</b>  <b>Generate control &amp; distribution of:</b> <ul style="list-style-type: none"> <li>• <b>Agricultural technology</b></li> <li>• <b>Credit for agricultural innovation</b></li> <li>• <b>Assets for agricultural production</b></li> <li>• <b>Inputs for agricultural production</b></li> </ul>	<p>Proxy: for Access:</p> <ol style="list-style-type: none"> <li>1. # of extension agents (FAO study 1989; Burt Swanson study (covers 23 countries, incl. China, India and Indonesia with 3 world largest extension systems*))</li> <li>2. Fertilizer consumption (100 g per ha of arable land/ F. consumption (mt) 185 c; 1961-02 , FAO</li> <li>3. Pesticide use intensity (FAOstat) 137 c; 1990-01</li> </ol> <p><b>Should have:</b></p> <ol style="list-style-type: none"> <li>1. Share of high-yield varieties as compared to traditional varieties (data on major crops should be found in reports by CGIAR and others)</li> <li>2. No. of farmers trained at various level (agricultural schools, farmers field schools etc).</li> <li>3. No of farms (and area) that have adopted or adapted new technologies (IPM, soil and water conservation measures, new production techniques etc).</li> <li>4. Measures to gauge the extent of effective interaction between farmers, extension and research systems (in different directions!)</li> </ol>	<p>Indicate the size of the technology dissemination structure (extension) <b>Note:</b> This has a very weak database. However, also the datasets of alternative extension approaches are weak.</p> <p>Indicators 2 and 3 are those with a relatively solid database. Assumes that the popularization of both agricultural techniques has been, at least in part, due to extension efforts in the wake of the 1960's agricultural revolution. However agricultural innovation has a much wider scope than the use of these inputs alone.</p> <p>Indicators missing also for:</p> <ul style="list-style-type: none"> <li>• Control and distribution</li> <li>• Credit</li> <li>• Agricultural assets</li> <li>• Other agricultural inputs</li> </ul>
<b>Agricultural Markets</b>	<ol style="list-style-type: none"> <li>1. World market prices for key agricultural commodities</li> <li>2. Demand for agricultural products (same commodities as under: see: 'Physical Capital – Production')</li> <li>3. Agricultural subsidies-support estimates for OECD countries as % of their GDP</li> <li>4. Terms of trade (HDR 2005, table 16)</li> </ol>	<p>Indicate demand for agricultural products as a base for market existence (2)</p> <p>Indicate producer price development (4) and world market prices (1)</p>

	<p>5. Technology diffusion and creation (tel. mainlines, cell users, internet users), Human dev. Report 2005, table 13</p> <p>6. Growth prospects in organic products (UNCTD Trade &amp; Environment. review 2006, <a href="http://www.unctad.org/en/docs/ditcted200512ch3p1_en.pdf">http://www.unctad.org/en/docs/ditcted200512ch3p1_en.pdf</a>)</p>	<p>Indicate degree of market distortion in OECD countries as a determining factor to the development potential of agricultural markets in developing countries (3)</p> <p>Indicate the quality of the infrastructural context for effective functioning of agricultural markets (5)</p>
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