Food, fibre and forest products

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Nine lead authors and nine contributing authors from 12 countries,

Reviewed ~450 references
Summary of key points

Crop production

• Crop responses depend on latitude

• High latitude: production increases with 1-3°C rise in local mean temp, decreases above 1-3°C rise.

• Low latitude: production decreases with 1-2°C rise in local mean temperatures

• Increased drought/flood frequency affect esp. subsistence sectors at low latitudes

• Globally, production increases to as local mean temperature rises up to 1-3°C, then decreases
Summary of key points

Commercial forestry

- Timber productivity rises modestly in the short to medium term, with large regional variability (and several uncertainties)

Aquaculture and fisheries

- Continued warming changes production and distribution of particular fish species, with adverse impacts (but few studies available)
2090-2099 rainfall change %

~2050 change
+ -
cereal
stock
forestry

Without adaptation
Maize

(a) Maize, mid- to high-latitude

(b) Maize, low latitude
(e) Rice, mid- to high-latitude

(f) Rice, low latitude
Uncertainties, scenarios, millions of people at risk of hunger

No CC, no CO₂ fertilization

- **A1**
- **A2**
- **B1**
- **B2**

**time**
Uncertainties, scenarios, millions of people at risk of hunger

No CC, no CO$_2$ fertilization

CC + CO$_2$ fertilization

time
Uncertainties, scenarios, millions of people at risk of hunger

No CC, no CO₂ fertilization

CC + CO₂ fertilization

CC, No CO₂ fertilization

Time
Will $\text{CO}_2$ fertilization effect be realised?

- Crop model projections generally consistent with experiments, but may tend to project fertilization effects ($\sim$15-20%) at the upper end of results from field experiments (10-20%)
- $\text{CO}_2$ fertilization experiments in developing countries lacking
- Forest $\text{CO}_2$ fertilization has probably been overestimated in mature stands, but not in young stands
Impacts on food prices by global temperature increase

![Graph showing the relationship between temperature increase and output prices, with different lines representing studies by Fischer et al. (2002a), Adams et al. (1995), Parry et al. (1999, 2004), Darwin (2004), and Reilly et al. (2003).](chart.png)
Severe impacts for subsistence cropping

- Not discussed explicitly in TAR
- Several studies have now been published
- Complex, mixed crop/land-use practices and include some use of wild resources
- Some effects mixed – e.g. in Tanzania maize – coffee/cotton +
Impacts on rain-fed agriculture

Suitability index

50% reduction in yield by 2020’s

Water run-off change
Pastures and livestock

alleviation of cold stress

> heat stress, reduced weight, productivity declines
Pastures and livestock

Extreme events in Africa

% national/local herd lost, various countries

- cattle
- sheep/goats

Year

• TAR conclusions confirmed of potential increases in global timber production, especially with new, poleward locations and CO₂ fertilization

• New knowledge: Regional variability of forest productivity impacts, lower CO₂ fertilization effects of mature forests (young stands experience ~20% increase at 550 ppm CO₂)
Forestry - uncertainties

Mountain pine beetle, North America; consistent with projections but also fire, drought,
Fisheries

- TAR conclusions on aquaculture and fisheries confirmed of generally greater stress, but some positive impacts
- New knowledge: Supports these general conclusions, providing greater regional detail
- Some effects already observed – poleward range shifts in NE Atlantic, some local extinctions and other negative impacts esp. on freshwater fisheries, e.g. Lake Tanganyika
Knowledge gaps

• CO₂ responses not well quantified – especially in developing countries
• Weed responses poorly understood
• Impacts of extreme climate events inadequately elucidated, local impacts even of mean changes not yet widely researched
• Aquatic resources – few projections available
• Adaptation research still not comprehensive across range of climate and socio-economic futures and developed and developing countries
• Impacts on biofuel and industrial crops not well understood