by the terrestrial biosphere. Further, the representation of crops and pasture brings climate models into the field of research hereto occupied by dedicated agricultural models. Details of management currently represented in these models (e.g. changes in sowing practices, irrigation, residue removals) may be of substantial importance not just for crop yields, but also the global carbon cycle, and hence climate. Thus, this issue is not just one of quantifying potential uncertainty in climate models, but also of understanding the importance of inconsistencies that exist between ESMs and agricultural models, such as those used for local scale climate impact studies. Using the dynamic global vegetation model LPJ-GUESS, recently updated to include a detailed crop model, we investigate the sensitivity of net ecosystem exchange of carbon to the treatment of crops and pasture in the model. We show that the choice of crop representation can be as influential as that of ESM on the modelled terrestrial carbon uptake, and increased detail in crop representation can increase the modelled difference between simulations with and without land-use change by as much as 100%, to the extent that the terrestrial biosphere may turn from a net sink to a net source of carbon. By investigating the sensitivity of the crop model to a range of different management options, we elucidate the key features/processes which control the uncertainty space. We discuss the significance of these results in terms of the global carbon cycle, and key processes for inclusion in ESMs and land-use scenarios.			
0184	Climate change impact and adaptation assessment in agriculture requires farming systems analysis and integrated assessment	Pytrik Reidsma, Joost Wolf, Argyris Kanellopoulos, Ben Schaap, Maryia Mandryk, Martin van Ittersum	The Netherlands
Climate change impact assessments in agriculture are usually based on crop models, as the crop level is the basic level where climate affects agriculture. In economics, Ricardian approaches based on statistics are used to assess impacts on farmers' income. Although such approaches provide valuable insights, they do not consider the farm level explicitly, whereas decisions regarding management and adaptation are mainly made at farm level. Farm level decisions influence impacts of climate change and variability, and should be considered. Farm level decisions are not only influenced by climate. In the past, the influence of technological development, policy and the market was larger than climate change. Societal changes also affect the role of agriculture. While agriculture has been mainly production-oriented throughout time, increasing environmental awareness and changing societal perspectives have led to the quest for a more multifunctional agriculture. Food and fibre production is not the only output of agriculture, other economic, environmental and social indicators have also become important for the viability of agriculture. We therefore argue that farming systems analysis and integrated assessment are needed for climate change impact and adaptation assessments in agriculture. In this presentation we will illustrate this with a case study in the Netherlands (Wolf et al., 2012). Assessments were performed for 2050 at two scale levels. At the EU level, a crop model was used to assess changes in crop yields due to climate change, and a statistical model to assess changes due to technological development. Next, this information was used in a market model to assess changes in product prices. These EU level changes formed input for the regional level assessment in Flevoland, a province with mainly arable agriculture. As impacts and adaptation differ per farm type, we first developed scenarios for farm structural change. Secondly, impacts of climate change on crops in Flevoland were assessed with a crop model and a semi-quantitative and participatory method that specifically focused on the impacts of extreme events and pests and diseases. Thirdly, we assessed the impact of different drivers at farm level. Results show that impacts of climate change are generally positive, but small compared to developments in technology, policy and markets. In other case studies, our models have also been used for dairy farming, and coupled to regional environmental and agent-based models to assess impacts on environmental			

emissions and regional land use change. More detail will be given in the presentation.			
0187	Disaggregating overstory and understory phenology in tropical savannas using time series decomposition and linear unmixing of vegetation indices	Qiang Zhou, Michael Hill, Jane Southworth, Kelley Crewes, Peter Scarth	USA
Ecosystem function in tropical savannas involves major interplay between climate, herbivory and fire, and the phenology of the overstory woody vegetation and understory grasses and shrubs. Across global tropical savannas, the mix of vegetation and phenology is highly variable, with predominantly evergreen overstory in Australia and South America, and predominantly deciduous overstory in Africa. In addition the understory varies from grasses and bare soil in more arid savanna to complex mixtures of grasses, palms, and shrubs in more mesic savanna. Accurate estimation of the changes in fractional cover of the photosynthetic (PV) and non-photosynthetic (NPV) woody and herbaceous vegetation, as well as fractional cover of bare soil (BS) from remote sensing is critical for better modeling savanna carbon and ecosystem dynamics. This paper reports on the development of methods to separate the dynamics of over- and understory cover fractions using time series decomposition and unmixing of vegetation index responses with 8 day 500 m MODIS Nadir BRDF (Bi-Directional Distribution Function) Adjusted Reflectance (NBAR) data for 2002 - 2011. The approach utilizes two methods developed in Australia: (1) the fractional cover of photosynthetic vegetation, non-photosynthetic vegetation and bare soil is estimated by linear unmixing of Normalized Difference Vegetation Index (NDVI) and Shortwave Infrared Ratio (SWIR32) (Guerschman et al., 2009); and (2) the persistent green tree fraction is estimated from decomposition of an NDVI time series using the seasonal-trend decomposition procedure (STL). The products of the two methods are then used to extract the separate tree and understory phenology and the results are validated using ground survey data. The approach is initially developed in Australian savanna using the National Fractional Cover Database and Landsat-based Persistent Green product for validation. The two methods have been successfully applied on Australia savanna eco-regions which are mainly dominated by evergreen trees and seasonal grasses. This paper reports the results of initial analysis for southern Africa utilizing field measurements for 2009-2011 supplied by our co-authors. The approach has been modified to accommodate the seasonal greening cycle of deciduous trees by developing a temporal within season multi-frequency decomposition approach utilizing seasonal frequencies from 1 to 1/16thof a year Initial results indicate multiple frequencies of green canopy cycling and significant variation in observed patterns within and between miombo woodlands, mopane woodlands and acacia savanna. The presentation in March 2014 will outline the results of African analysis and compare these with well validated results from Australian systems.			
0188	Interactions and trade-offs of ecosystem services under land use changes	Anita Bayer, Almut Arneth, Thomas Pugh	Germany
Ecosystems provide humankind with a range of beneficial resources and services. Climate change, land use and other forms of human utilization alter ecosystems, thus affecting these provisions. The concept of ecosystem services (ES) and natural capital provides a framework to evaluate the availability of environmental resources and to express them in terms that are meaningful to policymakers, economists and land managers. However, linking ecosystem function to service provision is critical and largely depends on (1) the multiple interacting functions within ecosystems across different locations, (2) the time period over which function and use are considered, and (3) how values are assigned to ES. Dynamic global vegetation models (DGVMs) can be used to simulate the biogeochemical cycles within an ecosystem and their interactions with land use and climate over a range of different spatial and			