The focus of this thesis is the catalytic production of diesel from biomass, especially emphasising catalytic conversion of waste vegetable oils and fats. In chapter 1 an introduction to biofuels and a review on different catalytic methods for diesel production from biomass is given. Two of these methods have been used industrially for a number of years already, namely the transesterification (and esterification) of oils and fats with methanol to form fatty acid methyl esters (FAME), and the hydrodeoxygenation (HDO) of fats and oils to form straight-chain alkanes. Other possible routes to diesel include upgrading and deoxygenation of pyrolysis oils or aqueous sludge wastes, condensations and reductions of sugars in aqueous phase (aqueous-phase reforming, APR) for monofunctional hydrocarbons, and gasification of any type of biomass followed by Fischer-Tropsch-synthesis for alkane biofuels. These methods have not yet been industrialised, but may be more promising due to the larger abundance of their potential feedstocks, especially waste feedstocks. Chapter 2 deals with formation of FAME from waste fats and oils. A range of acidic catalysts were tested in a model fat mixture of methanol, lauric acid and trioctanoin. Sulphonic acid-functionalised ionic liquids showed extremely fast conversion of lauric acid to methyl laurate, and trioctanoate was converted to methyl octanoate within 24 h. A catalyst based on a sulphonated carbon-matrix made by pyrolysing (or carbonising) carbohydrates, so-called sulphonated pyrolysed sucrose (SPS), was optimised further. No systematic dependency on pyrolysis and sulphonation conditions could be obtained, however, with respect to esterification activity, but high activity was obtained in the model fat mixture. SPS impregnated on opel-cell Al₂O₃ and microporous SiO₂ (ISPS) was much less active in the esterification than the original SPS powder due to low loading and thereby low number of strongly acidic sites on the real catalyst. The ISPS-packed-bed catalysed conversion of rapeseed oil revealed low activity but advantageous flow properties. A number of functionalised, organic bases have been tested for their activity in transesterification of trioctanoate with methanol, especially guanidines. The activity for trioctanoate conversion was promising, however, hygroscopic catalysts may lead to saponification of the triglycerides. Hydrodeoxygenation is treated in chapter 3. The reaction routes and activity in batch hydrodeoxygenation are strongly dependent on the supported noble metal catalyst and temperature used for the conversion to alkanes. Generally, Pt and Pd were the most active metals and have highest selectivity for decarboxylation reaction. Stearic or oleic acid were converted much faster than tripalmitin. The deoxygenation was performed in a continuous trickle-bed reactor over 2 wt% Pd/Sibunit at 300°C. 10 wt% stearic acid yielded almost complete and selective conversion to heptadecane in 5% H₂/Ar at 20 bar, however pure Ar gas led to deactivation. A deactivation profile by coking builds up as a function of the distance from the reactor inlet. A constant conversion of 12% was obtained with neat stearic acid in 7 days time-on-stream of the spent catalyst. The activity for deoxygenation in continuous mode decreased as stearic acid > ethyl stearate > tristearin under 5 % H₂ in Ar, while lack of H₂ in the feed quickly led to complete deactivation of the catalysts in all feeds. The work is concluded with a summary and an outlook in chapter 4.