



INTERNATIONAL FOOD
POLICY RESEARCH INSTITUTE
sustainable solutions for ending hunger and poverty

Responses to Question #2: Indicators for measuring food security impacts at various levels

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Key Question to address

Which indicators should be used to measure these food security-related impacts of bioenergy production at the international, national and project-site levels?

Key linkages to food security

	Local	National	International
Availability	Local production Local stocks	National production National stocks Export/import	International trade flows (incl. Food aid)
Access	Hhold income & purchasing power	Foreign exchange	Global price levels Int'l financing
Stability	Hhold assets & remittances	National policies (macro-economic, social protection)	Trade policies (WTO) & interventions by int'l institutions (IMF, WFP)
Utilization	Hhold energy use & food preparation quality	Food quality standards	Int'l phyto-sanitary standards

prices

prices

International level impacts

Description of indicator	Availability & difficulties in measurement	How to isolate bioenergy impacts
World market price	Data available from market analysis organizations which monitor price movements in key markets (USDA-ERS, WB)	Statistical or simulation-based model analysis
Trade flows	National statistics, collected and analyzed by national and international agencies (FAO, OECD, ERS, others) – often observed with a lag	Simulation model-based analysis
Food aid	From international agencies involved in relief & procurement of aid (WFP)	Econometric or simulation model analysis

National level impacts

Description of indicator	Availability & difficulties in measurement	How to isolate bioenergy impacts
Malnutrition	International organizations (WFP and national surveys by local or outside agencies. Consumption data might be more readily available than anthropometric measures of malnutrition (e.g. underweight measures for small children)	Focus on changes in diets related to key staples, and test for changes in calorie intake with statistical analysis
Poverty headcount	Nat'l statistical bureaus & externally-funded surveys with representative samples (WB) [costly & infrequent surveys]	Isolate the effects on wages or hhold ag revenue and total expenditure with econometric analysis
National trade in food staples (incl. food aid)	National bureaus of statistics (observed with lags due to delays in reporting)	Econometric or simulation-based model analysis

National level impacts (cont.)

Description of indicator	Availability & difficulties in measurement	How to isolate bioenergy impacts
Export/import volume and value of fossil fuels	National bureaus of statistics and ministries/agencies relating to energy and commerce (observed with lags)	Econometric or simulation-based model analysis
Exchange rate movements	International & national bodies monitoring movements in currency and exchange markets (readily available and continually updated)	Econometric or simulation-based model analysis
Employment headcount	National bureaus of statistics (ministry of labor, etc) (observed with lags)	Analysis of statistical data controlling for non-biofuel factors in changes in employment

Project/site-level impacts

Description of indicator	Availability & difficulties in measurement	How to isolate bioenergy impacts
Local employment & wages	Project team carrying out local-level sampling and surveys	Focus on biofuel feedstock crop sectors and related sectors activities; May need an econometric analysis to test b/w communities with & w/o biofuels projects
Road improvement (& other infrastructure)	Local surveys by project teams or statistics of national ministries and agencies related to infrastructure	Look for significant differences in development of roads in bioenergy project regions (needs data over time to relate causality to project)
Land prices	Local survey of land values and prices with appropriate design	Econometric analysis of data controlling for land tenure types and other factors. Requires choice of proxies (when formal land mkts do not exist) – perhaps rentals
Prices of staples in local market	Sampling of retail-level prices in project region by appropriate design	Model-based analysis that captures key staples (plus complements/substitutes) and market structure with transaction costs
Population displacement	Focus group or community surveys, or evaluation by project team. Some national NGOs may have this information	Qualitative analysis of data to detect associations and trends that can be related to biofuel-related projects.

Related methodological question

Are there proven methodologies to isolate food security-related impacts arising from bioenergy production (or that of related industries)?

Strengths & weaknesses of these methodologies?

Simulation-based modeling

Strengths	Weaknesses
• Can help to isolate confounding and countervailing effects, with appropriate model design and scenario analysis • Allow the analyst to objectively quantify the sources of data or parameter uncertainty with stochastic or scenario-based analysis • Can be used to illustrate counterfactuals in a clean way (with appropriate scenario design)	• Require structural parameters that are representative and robust – which may not exist depending on available data – in the absence of this values borrowed from other studies or from “expert” opinion could be subject to bias • Structure may not correctly reflect the ‘true’ underlying empirical reality, and lead to misleading results and indicators • Often are constructed at a level that is too aggregate to be useful (driven by the way the data is usually collected) – obtaining a more disaggregate specification may difficult due to data availability

Econometric modeling methods

Strengths

- Can be more flexible in how it uses the available data
- Allows the analyst to test for significance in the measured relationships and to say more about causality (with appropriate data)
- Can handle a more disaggregate level of analysis (household), although the degree of heterogeneity across households that can be considered depends on the degrees of freedom in the data
- Can handle more categorical or qualitative types of data variables more easily than a simulation model (which requires quantitative measures of all variables, for the most part)

Weaknesses

- Can be difficult, sometimes, to identify and appropriately control for sources of endogeneity
- Can also be data intensive (depending on the level of heterogeneity the analyst wants to capture)
- The outcomes are highly sensitive to data quality and appropriateness of sampling and survey design (the ‘perfect’ data for an econometric regression rarely exists)
- Can only capture those effects that occur within the periods for which data observations exist – some out-of-sample forecasting is possible, but limited in scope (one/two periods ahead)

Concluding Remarks

The nature of methodological techniques depends very much on the indicators that are desired and the data available

Some indicators/methods are more appropriate at the household level, compared to a more aggregate level of analysis – which has significant implications for data needs

Need some sound conceptual/theoretical underpinnings in order to design and measure indicators that are meaningful and useful for food security analysis – the context of bioenergy presents unique challenges