



**Global Strategy**  
IMPROVING AG-STATISTICS



# EVALUATING THE COST-EFFICIENCY OF REMOTE SENSING IN DEVELOPING COUNTRIES



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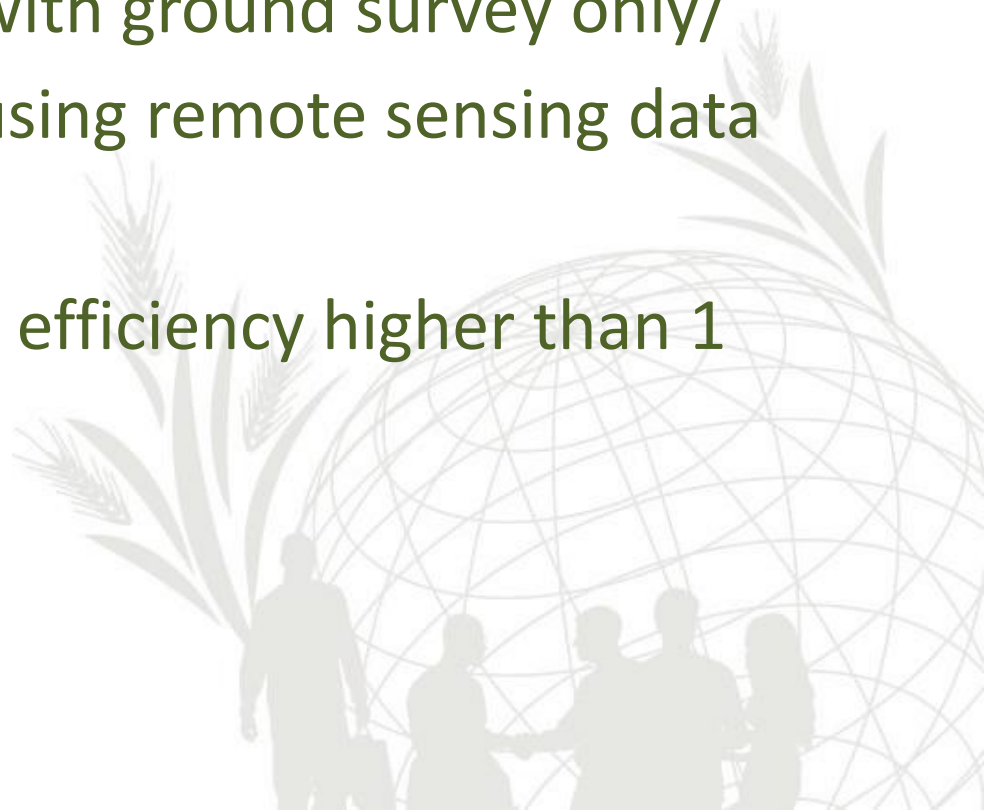
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## COST EFFICIENCY OF REGRESSION ESTIMATOR

- Relative efficiency of estimator using remote sensing data as auxiliary variable
- Variance of estimates with ground survey only/
- Variance of estimator using remote sensing data
- With the same budget
- Cost efficient if relative efficiency higher than 1





## COST EFFICIENCY OF STRATIFICATION (1)

- Relative efficiency of stratification is the ratio between the variance that would have been obtained without stratification and the estimated stratified variance
- Efficiency strongly depends on landscape complexity
- Where crops are very mixed up efficiency low
- In pilot areas of the MARS Project ranged in most cases from 1.1 to 1.6





## COST EFFICIENCY OF STRATIFICATION (2)

- High efficiency where a certain crop is dominant (in Catalonia a value of 10 for rice in 1992)
- Cheap stratification using existing land cover maps
- Test in Spain with an agricultural intensity index computed on CLC
- efficiency between 1.7 and 2.2 for main crops (Gallego et al., 1999a)





## EARLY EXPERIENCES OF ASSESSMENT OF COST EFFICIENCY

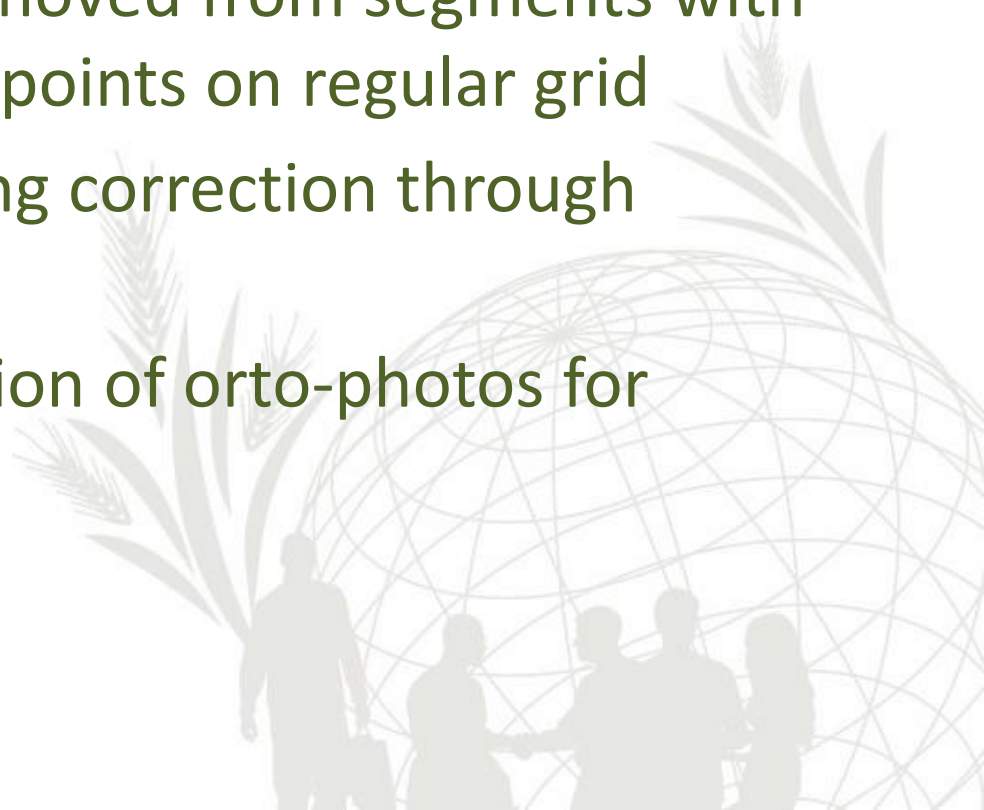
- USDA-NASS runs most important operational application based on area frame survey and remote sensing for agricultural statistics
- Cost-efficiency analysis has given positive conclusions for this program
- MARS project of the JRC in the 90's demonstrated insufficient cost-efficiency in the EU





## COST EFFICIENCY FOR ITALIAN PROGRAMME

- Italian AGRIT programme realized low cost efficiency of use of satellite data at estimator level, when sampling frame moved from segments with physical boundaries to points on regular grid
- Dropped remote sensing correction through regression estimator
- Kept photo-interpretation of orto-photos for stratifying points





# LITERATURE REVIEW (1)

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[http://www.earthobservations.org/documents/cop/ag\\_gams/GEOSS%20best%20practices%20area%20estimation%20final.pdf](http://www.earthobservations.org/documents/cop/ag_gams/GEOSS%20best%20practices%20area%20estimation%20final.pdf)





## FINANCIAL BENCHMARK FOR COST-EFFICIENCY

- A key financial benchmark for cost efficiency is cost of current surveys
- FAO reports an average expenditure per country in Africa in 2007 of US\$ 657 000; FAO (2008) The State of Food and Agricultural Statistical Systems in Africa – 2007, RAF publication 2008E, FAO regional office for Africa, Accra
- Including estimation of crop area and yield, production means and socio-economic information



# MARGIN FOR COST-EFFICIENCY

- Remote sensing applications to agricultural statistics can be sustainable if their total cost fits in the budget without endangering the feasibility of surveys that cannot be substituted by satellite technology
- Narrow margin for cost-efficiency
- free data policy helps





## SUB-TOPICS REQUIRING FURTHER RESEARCH

- Efficiency of remote sensing at:
  - design level in various kinds of landscape in developing countries (stratification of segments, photointerpretation of points, kind of satellite data)
  - estimator level in various kinds of landscape (small fields, mixed cropping)
- Other kinds of use or remote sensing (remote sensing for reducing sampling area or observation, agro-meteorological yield forecasting model, other models)
- Labour cost
- New satellites free of charge
- Capacity development at country or regional level?



## THANK YOU

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