Regionalized water-footprint (AWARE) of rice as modelled in LCA software: introduction to the case and task

69th LCA forum

ETH Zürich, 13 September 2018

Software Solutions for regionalized LCA: purpose & goals

- Showcase implementation of regionalisation in LCA softwares
- To what extent and how do LCA softwares support regionalised LCAs
- First step towards harmonising regionalised LCI/LCA in commercial softwares

Scope of the rice LCA case study

- 2 scenarios of cooked rice LCA
  - Urban China
  - US-Europe/Switzerland
- Inventory data
  - Ecoinvent v3.5,
  - Agri-footprint database,
  - working papers
    (Jungbluth 1997; Singh et al. 2014)
- Case study of the “Global LCIA guidance” project of the Life Cycle Initiative hosted by UN Environment

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UNEP/SETAC CORNER

Global guidance on environmental life cycle impact assessment indicators: progress and case study

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Abstract
Purpose The life cycle impact assessment (LCIA) guidance flagship project of the United Nations Environment Programme (UNEP)/Society of Environmental Toxicology and Chemistry (SETAC) Life Cycle Initiative aims at providing global guidance and building scientific consensus on environmental LCIA indicators. This paper presents the progress made since 2013, preliminary results obtained for each impact category and the description of a rice life cycle assessment (LCA) case study designed to test and compare LCIA indicators.
Methods The effort has been focused in a first stage on impacts of global warming, fine particulate matter emissions, water use and land use, plus cross-cutting issues and LCA-based footprints. The paper reports the process and progress and specific results obtained in the different task forces (TFs). Additionally, a rice LCA case study common to all TF has been developed. Three distinctly different scenarios of

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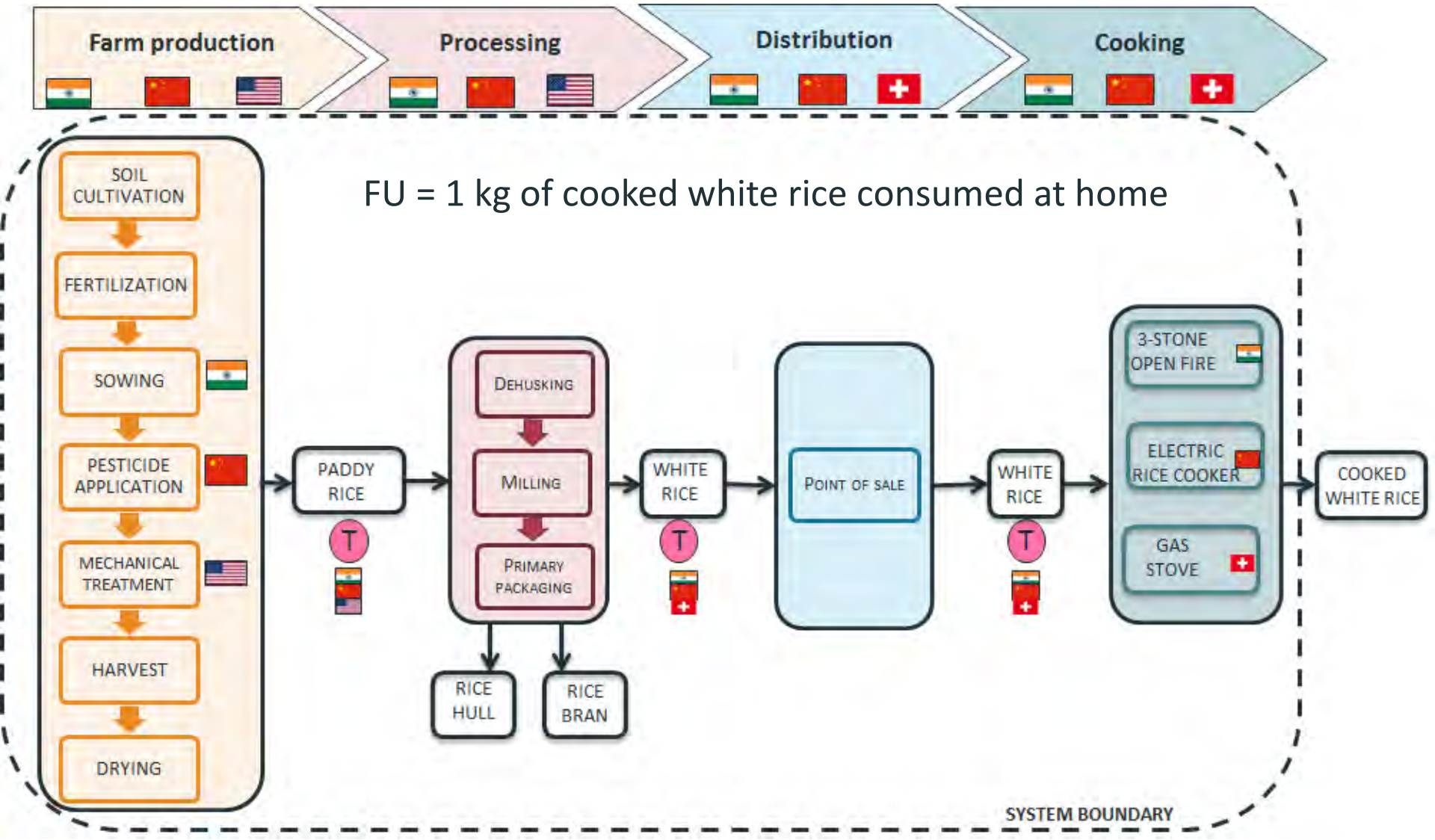
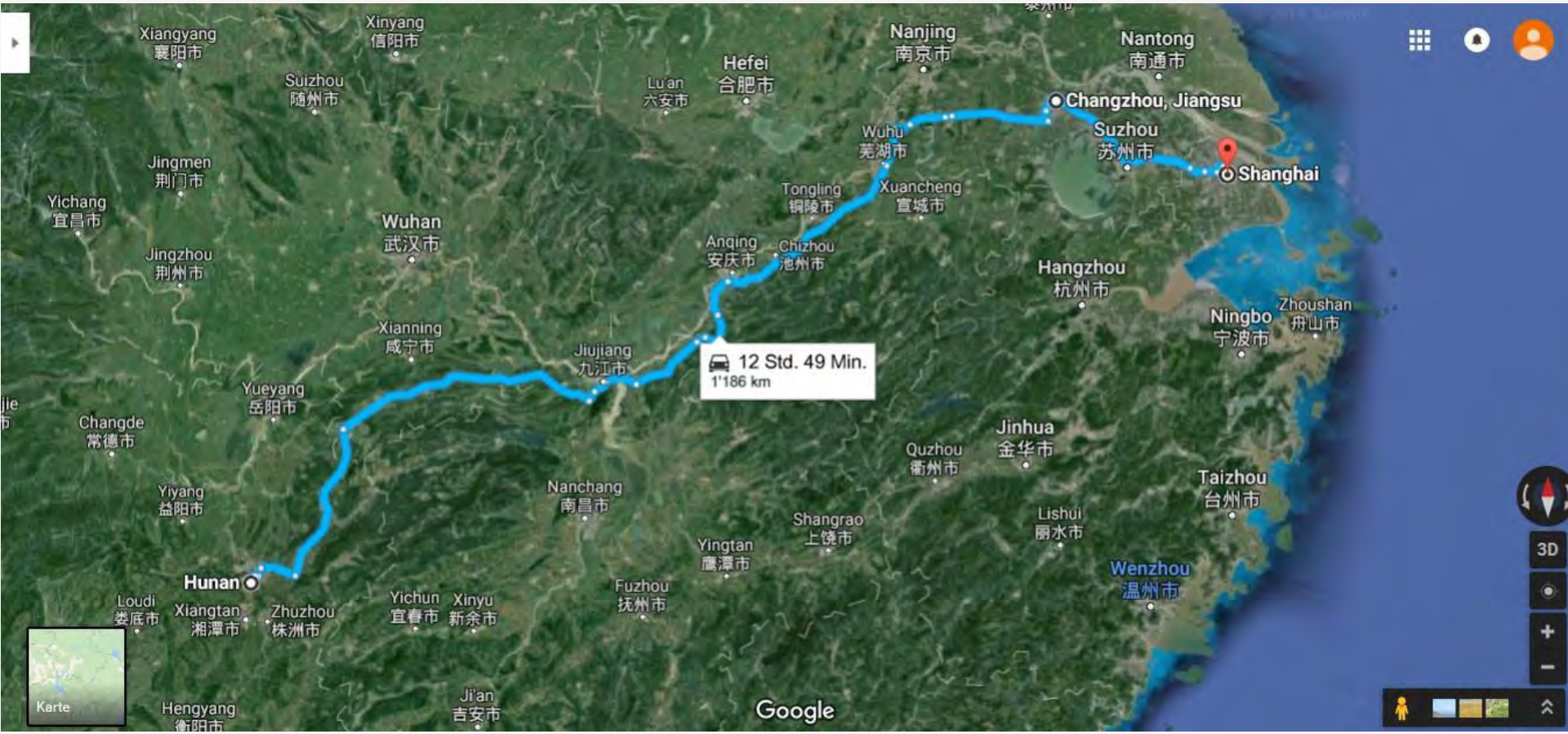
Product system



CN: Hunan – Chengzhou - Shanghai



US/CH: Arkansas – Rotterdam - Geneva

Life cycle stages

Farm production

- all field operations from cradle to farm gate (incl. Direct land occupation and water usage)

Processing

- includes transportation to processing plant, dehusking, milling, primary packaging
- 2 co-products of white rice
- economic allocation

	Price [$/kg]	Mass allocation [%]	Economic allocation [%]
White rice	0.5 [2]	70 [1]	94
Rice husk	0.01 [3]	20 [1]	1
Rice bran	0.2 [3]	10 [1]	5

Life cycle stages (II)

Distribution

- Includes transportation to point of sale and transportation to household

Cooking

- CN: Electric cooker
- US/CH: glass ceramic gas stove

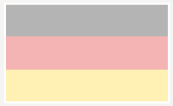
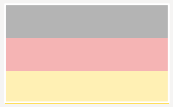
Life cycle inventory data

Life cycle stage	Unit	China	USA/Switzerland
Farm production			
Rice yield	kg / ha	6450 [1]	7452 [3]
Water consumed per kg rice produced	m^3	0.487 [4]	0.835 [4]
Water withdrawn per kg rice produced	m^3	0.935 [4]	1.352 [4]
Processing			
Distance to processing plant by lorry (>32t)	km	50	
Emission standard of lorry (>32 t)		EURO III [5]	EURO V [5]
Plastic bag per kg white rice	kg	0.01	
Cardboard box per kg white rice	kg	0.05	
Distribution			
Distance by lorry to point of sale	km	1300	1600
Emission standard of lorry (>32 t)		EURO III [5]	EURO V [5]
Distance by transoceanic freight ship	km	0	8000

Life cycle inventory data, continued

Life cycle stage	Unit	China	USA/Switzerland
Cooking			
Grocery shopping weight	kg	10 [7]	18 [7]
Mode of transport to point of sale		public bus	car, diesel, EURO 5
Distance from household to point of sale	km	3	5
Water usage per kg cooked rice	l	1.1 [9]	1.1 [9]
Rice needed for 1 kg cooked rice	kg	0.7	
Useful energy needed to cook 0.7 kg white rice	kWh	0.3	
Cooking device		electric rice cooker	gas stove
Cooking fuel		electricity	natural gas
Energy efficiency of cooking device	%	90 [12]	90 [12]

Outreach to major LCA software providers

- openLCA 
- SimaPro 
- Brightway 2 
- Regis 
- GaBi 
- Umberto 
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