A Review of Two Different Methods for the Estimation of Water Footprint of Crops

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Contents

1. INTRODUCTION

Introduction_Background

- Freshwater in sufficient quantity and adequate quality is a fundamental resource to ecological and societal activities (Bayart et al., 2010)
    1- Food Production
    2- Industrial activities
    3- Human sanitary conditions

- Agricultural sector is major freshwater consumer and 70 % of the world's freshwater withdrawal is for irrigation (Gheewala et al.,2014)

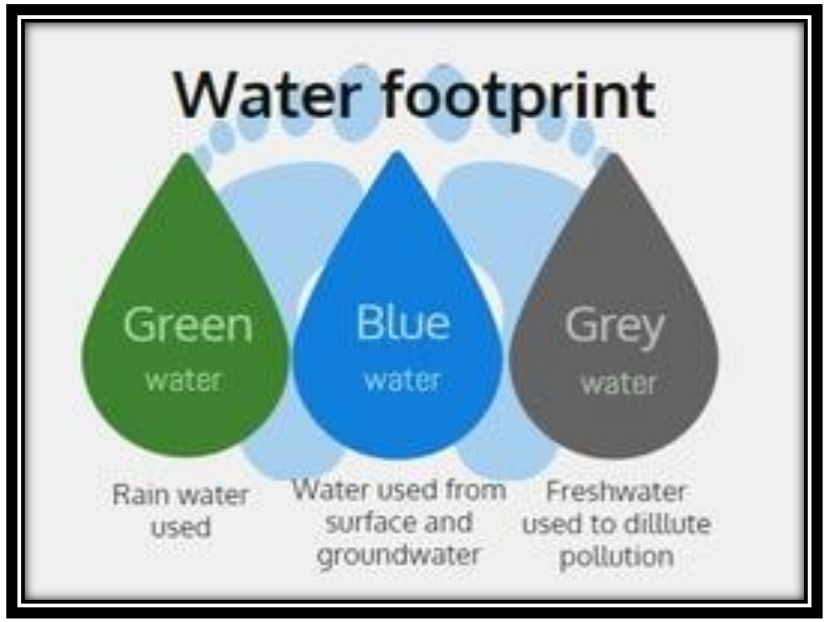
- Water consumption for agriculture will increase 19% by 2025 (World Water Development Report)

Introduction_Problem Statement

- Importance of fresh water
- Water scarcity and water pollution
- Climate change impact on crop water demand
- Unequal distribution of fresh water resources
- Lack of fresh water availability for daily needs
- Population growth and urbanization
- Agricultural requirement for fresh water

Two approaches to water footprint

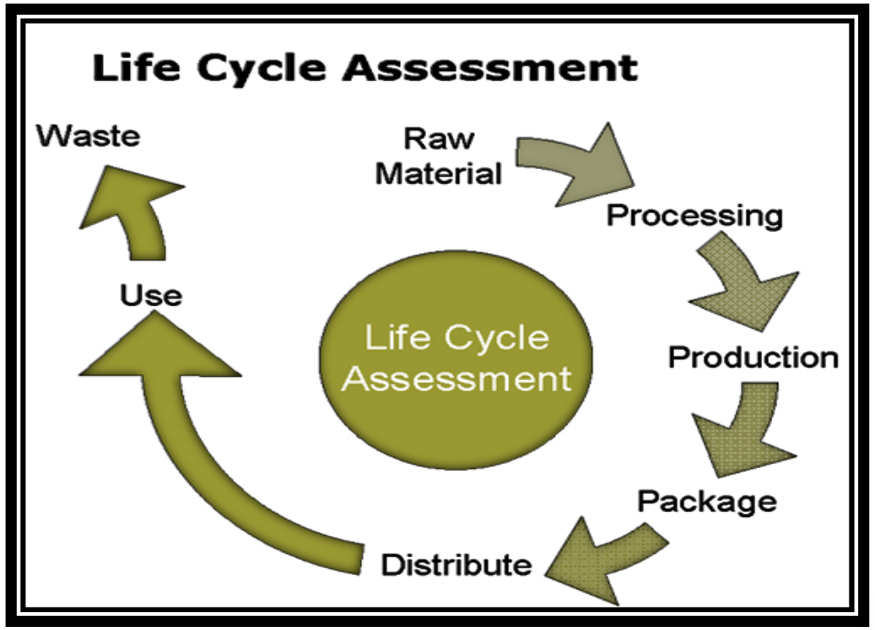
1. Water footprint network (WFN)
   - Volume of fresh water requirement
   - Three components of water footprint (WF)
     a. Green water footprint
     b. Grey water footprint
     c. Blue water footprint



Two approaches to water footprint

2. Life cycle assessment (LCA)

- Total amount of water used from cradle to grave
- The quantification of environmental impacts related to fresh water use i.e. water scarcity and water pollution e.g.
    a. Eutrophication
    b. Acidification
    c. Eco-toxicity etc.



OBJECTIVE

Objective of the study

“To compare the two major approaches of water footprint assessment.”

2. METHODOLOGY

Water footprint network (WFN) approach

Water footprint (WF) assessment is divided into four stages.

1. Setting goals and scope
2. WF accounting
3. WF sustainability assessment
4. WF response formulation

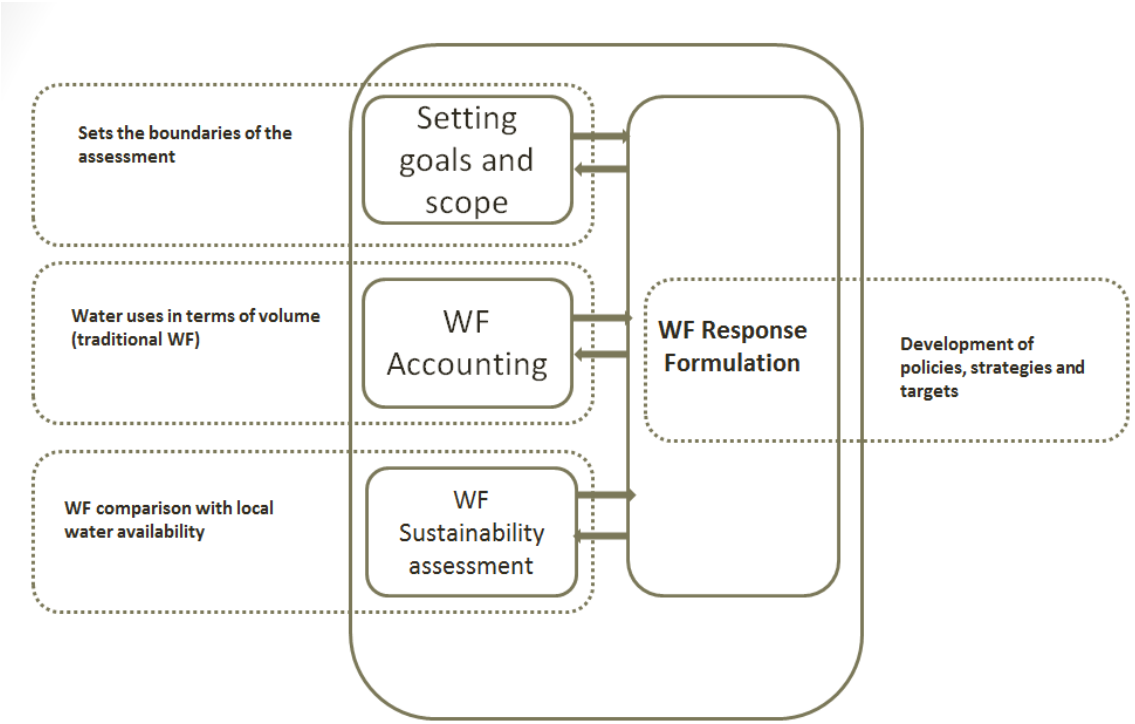


Fig 1: Water footprint network approach

Marrison and Schulte, 2010

Life cycle assessment (LCA) approach

Unlike WFN approach, LCA approach considers water use and related environmental impacts due to emissions causing the resource pollution.

LCA approach also have four stages of impact assessment.

1. Goals and scope
2. Life cycle inventory
3. Life cycle impact assessment
4. interpretation

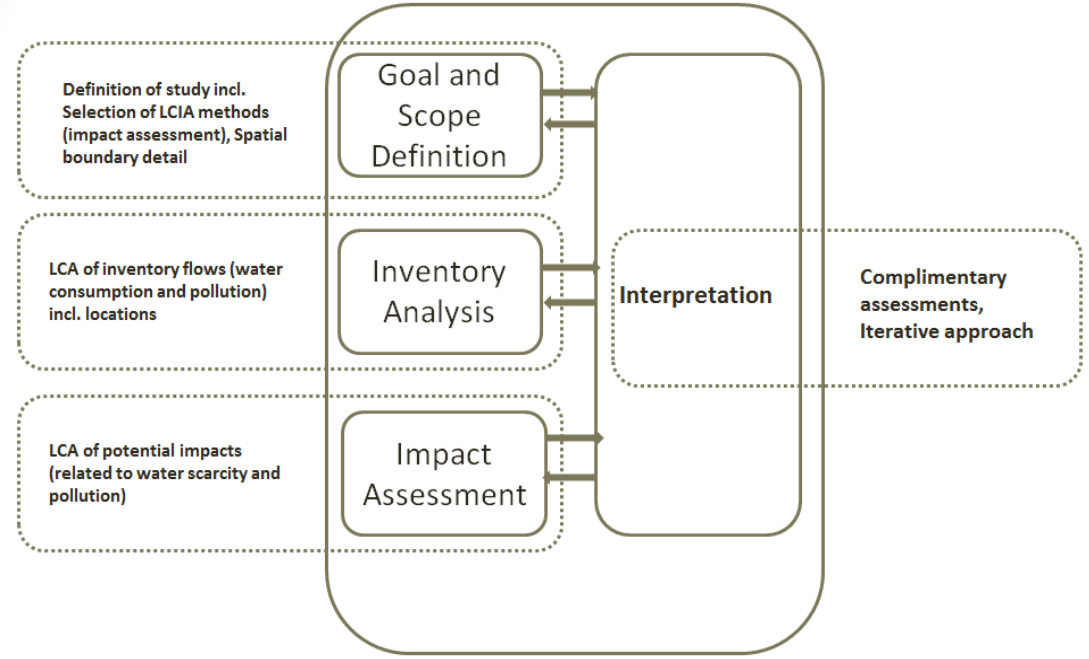


Fig 1.1: Life cycle assessment approach

Marrison and Schulte, 2010

3. Results and Discussion

Results_Differences in WF and LCA approach

Table 2: Difference between WFN and LCA approach

WFN Approach	LCA approach
1. Includes Green water	1. Green water is not included and accounts it in a different way
2. Grey water footprint component to account for water quality	2. Several impact categories are used to account for water quality
3. Measures the consumptive use of water i.e. evaporated water	3. Measures both consumptive and non-consumptive use of water
4. Results are shown in terms of actual volume of water consumed	4. The results can be shown in different impact categories

Results and Discussion

➢ Why Green water is excluded in LCA?

- The Green water measures the part of evaporated rain water.
- Green water resources are limited and scarce which gives an argument to account green WF like blue WF.
- Green water consumption by product system does not introduce significant changes in local environment.
- Consequently Green water is excluded from impact assessment phase in LCA.

Results_Strengths and Weakness of LCA and WF approach

Table 3: Strengths and Weakness of LCA and WF approach

Aspects	LCA	WF
Strengths	1. Cradle to grave analysis	1. Addresses local and temporal nature of weather-related impacts at localized levels
	2. Tools facilitates ease for calculation for large systems	2. Well established approach for the calculation of evaporated water.
Weakness	1. Little data available on crop production	1. Difficult to calculate impacts when large systems are involved
	2. Green water is not included	2. Lack of background data on consumed water
	3. Limited spatial and temporal resolution of impact assessment	3. Regional water scarcity is not addressed in final water footprint

4. CONCLUSION

Conclusion

- The joint efforts of both approaches could lead us to better assess the sustainability of freshwater use.

- Both LCA and WFN have its own advantages and disadvantages, but selection should be done based on aim of the study, available data and desired output from the study.

- The review of both methodologies helped in better understanding about the concept of water footprint.

Any Questions?

Thank you!!!

5. References

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