

Socio-economic impacts of parasitic weeds in rainfed rice systems of Sub-Saharan-Africa

WOTRO - Integrated Programme, “PARASITE”
PhD Research Project 3



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Background-Problem

1. Existing gap between domestic rice production and consumption is increasing
2. Due to many (biotic and abiotic) production constraints
3. Parasitic weeds are among the most damaging biotic constraints
4. No reliable economic data are available for decision-making support
5. Data on overall impact of parasitic weed on rice production will shed light on possible productivity gain and resources saving from solving parasitic weed problem

Objective

- Assess the economic and social impact of parasitic weeds and control strategies in order to provide any further guidance for decision-making for rice farmers, researchers and policymakers in parasitic weed management strategies development.

Sub-objectives

- SO1. Identify the key factors explaining the risk of parasitic weed infestation of rain-fed rice fields and the infestation severity.
- SO2. Assess current status of parasitic weeds infestation problem and coping strategies in rain-fed rice systems.
- SO3. Assess the efficacy of rice farmers for various weed management strategies used and factors affecting their efficiency.
- SO4. Assess the impact of parasitic weed infestation on productivity and production resources use.

Overall Research activities highlights

- TSP
- PhD courses
- Research Proposal (1)
- MSc Supervision (1)
- Baseline survey (3) in Benin, Cote d'Ivoire and Tanzania
- Data analysis, modelling and report
- Quarterly Progress reports
- Conference papers/posters/workshop (2)
- Papers writing and publication (4)
- PhD Dissertation writing and publication (1)
- Public defence of PhD Thesis (1)

Overall progress, Academic

Activities	Status	Period	Observation
TSP	completed		TSP submitted and approved
PhD courses	completed	2011 - 2013	Minimum requirement of TSP is achieved
Research Proposal	completed		Submitted and approved since 2011
MSc supervision	completed	2012-2013	2 MSc of INP-HB , Cote d'Ivoire successfully defended thesis on July 12th , 2013 in Agricultural economics

Overall progress, Research/Publication

Activities	Status	Period	Observation
Baseline survey in Benin, Cote d'Ivoire and Tanzania	completed	2011-2012	Some data were not collected in Cote d'Ivoire and Tanzania mainly, due to timing and insufficiency of resources. Many observations are missing in Tanzania dataset
Data analysis, modelling, report	completed	2012-2014	One descriptive report (Benin), Econometric modelling (M 1-3) and semi parametric models (M 4) were used
Progress reports	update	6monthly	6 progress reports and 7 trip reports completed
Manuscripts	2 under review	2013-2014	M1 AgSyst (IF=2.504), M2 CroPro (IF=1.303)
	2 processing	2013-2014	M3 FoodSec (IF=2.072), M4 writing
Conference papers/posters	2 completed	2013	. 12 th WC on PP July 15-20 , Sheffield, UK . 3 rd AfricaRice Congress, Oct. 21-24, Yaoundé, Cameroon
	2 submitted	2014	4th International Rice Congress Bangkok, Thailand (October 27-31)
Workshop/PhD presentation	completed	2011-2014	4 PhD seminars, 4 workshops completed

Work in progress

- Incomplete draft paper 4 (second stage estimate)
- Revision of paper 2 (re-submit to Crop Protection)
- Finalize paper 3 and submit to Food Security (expecting inputs from co-authors)
- Thesis compilation (General Introduction, Discussion and Conclusion)

Research Highlights



Determinants of parasitic weed infestation in rainfed lowland rice in Benin

(manuscript 1, Agricultural Systems)

N'cho, SA., Mourits, M., Rodenburg, J., Demont, M. and Alfons Lansink,. AO.

- Problem
 - *Rhamphicarpa fistulosa* is threatening rainfed lowland rice in Benin
 - Little information is available on key factors influencing infestation and farmers' ability to deal with the problem
- Objective
 - Explore factors that affect the infestation and farmers' ability to deal with the problem.
- Analytical framework: Double-Hurdle model
- Data source : Benin

Key findings

- A higher likelihood of infestation of plot is associated to a lower observed severity of parasitic weed infestation
- Farmers' cropping practices affect directly or indirectly the occurrence and the severity of infestation of their plots (*e.g. land preparation, herbicide use, weeding frequencies; sowing time, fallow length, etc.*)
- The ability to deal with the severity of the infestation is mainly determined by farmers' capacity to access and manage productive resources (*plot size, soil fertility, fertilizer use, herbicide use, etc.*)

Synthesis and Implications

- Farmers can reduce both the likelihood and severity of infestation of their plots if they are aware of factors causing the problem given their access and management capacity of productive resources
- Farmers' awareness of the parasitic weed problem and coping methods should be improved by a better institutional reform of traditional extension services
- Necessary actions to
 - Improve access to land, (focus on women)
 - Improve inputs sector (access to market, acceptable prices etc.)

Determinants of farmers' choice for parasitic weed management practices in rain-fed rice systems in sub-Saharan Africa (manuscript 2, Crop Protection)

N'cho, SA., Mourits, M., Rodenburg, J., Mohamed, JK., and Alfons Lansink,. AO.

- Problem
 - Rice farmers commonly choose from a range of weed management practices (WMP).
 - Why farmers adopt or not adopt existing WMP?
 - How does parasitic weed infestation affect the adoption structure of WMP?
- Objective
 - Identify farm-specific characteristics, socio-economic and institutional factors that influence farmers' choice for WMP
- Analytical framework: Multivariate Probit model
- Data source : Benin , Cote d'Ivoire and Tanzania

Typology of weed management practices (WMP)

- 13 WMP were surveyed
- Traditional WMP
 - Manual, hand and hoe weeding
- Modern (improved) WMP
 - Soil fertility management, water control, rotation with legumes, use of clean seed, resistant or tolerant rice varieties, herbicides use (see Douthwaite et al., 2007, Harker and O'Donovan, 2013; Oswald, 2005).

Key findings.

- Some WMPs are used on a complementary base (e.g. fertilizers and herbicides) while some were substitutes (e.g. herbicides and water control, herbicides and hoe weeding)
- Farmers affected by parasitic weed problem tend to adopt many WMPs
- Factors like access to input credits, training in agricultural practices, access to information etc. shift farmers away from using a single traditional WMP towards the use of integrated weed management strategies

Synthesis and Implications

- Future parasitic weed management technologies should be oriented on an integrated approach (IPWM)
- A good starting point to develop IPWM for rain-fed rice systems should explore the determinants of different combinations of WMPs used by farmers
- Country-specific approaches are required to address country-specific factors that affect adoption of WMPs

Impact of parasitic weeds infestations on rice farmers' productivity and technical efficiency in SSA (manuscript 3, Food Security)

N'cho, SA., Mourits, M., Demont, M., Adegbola, PY., and Lansink, AO

- Problem
 - Productivity and Efficiency of farmers are reduced by many production constraints including parasitic weeds (PW)
 - To what extent parasitic weeds affect rice farmers' productivity?
 - How PW and other managerial factors affect farmers' efficiency?
 - These specific issues have not been investigated specifically
- Objective
 - Assess direct and indirect impacts of PW on rice farmers' productivity and identify sources of production inefficiency
- Analytical framework : Stochastic Frontier model
- Data source : Benin and Cote d'Ivoire

Key findings

- PW induce **directly** 32% productivity loss in Benin and 18% in Cote d'Ivoire
- Farmers' inefficiency increases continuously as area infested increases
- A 1% additional area infested induces **indirectly** additional production loss of 0.5% in Benin and 0.2% in Cote d'Ivoire
- Farmers' with fields most frequently infested have a higher technical efficiency and a lower production uncertainty

Synthesis and Implications

- Farmers' productivity and efficiency are affected negatively and significantly by PW problem
- It might compromise efforts to boost domestic rice production in SSA
- Governments should take actions to prevent or contain the PW problem

Inefficiency of weeding labour in rainfed rice systems under parasitic weeds infestation

(manuscript 4, incomplete draft)

N'cho et al., 2014

- Problem
 - Manual weeding as the predominant practice to control potential damage to rain-fed rice crop due to weed, uses the greatest share of labour
 - How efficiently farmers use weeding labour?
 - What are the sources of possible inefficiency and how parasitic weeds affect inputs inefficiency?
 - These issues have not been addressed!
- Objective
 - Assess the inefficiency of manual weeding labour and identify the sources of inefficiency in the context of parasitic weed infestation
- Analytical framework: Directional input distance function and truncated bootstrap regression model
- Data source : Benin and Cote d'Ivoire

Key findings

- Substantial inefficiencies exist in rainfed rice farmers in both countries (e.g. 53% and 69% in Benin and 41% and 58% in Cote d'Ivoire respectively for overall and weeding labour inefficiency)
- The difference in weeding labour inefficiency between infested and non-infested farms were not significant
- Parasitic weed infestation did not impact significantly input use inefficiency (???)

Second stage truncated bootstrap regression, preliminary results

Variables	Benin		Cote d'Ivoire	
	Coefficients	Standard Errors	Coefficients	Standard Errors
Female farmer	.0672557	.0626523	.0295415	.0719358
Education	.0068704	.0082736	-.0222506**	.0102733
Household size	.0029082	.004701	-.0005788	.0045433
Share of extra-household labour in total weeding labour	.0000522	.0007645	.0005211	.0005896
Area infested	.000735	.0006874	.0027537**	.0011411
Land area cropped	-.3275349**	.118934**	-.0209943	.0254859
Manual weeding once	-.1883556	.131816	-.1103629**	.0533982
Manual weeding three and more	-.0388266	.0529263	.1110281	.0744888
Dummy Off farm revenue	.0079793	.0621826	-.0402957	.0526054
Memberships of farmer organisation	.0411705	.0566476	-.0301405	.0494363
cwext	-.0111642	.074664	-.0652398	.0530091
cons	.792872	.1026516	.8024918	.0826992

** P<0.05

Synthesis and Implications

- Rice farmers can maintain their current production level and save 58% of weeding labour in Cote d'Ivoire and 69% in Benin
- Rice farmers can reallocate a substantial fraction of labour to other productive activities without threatening rice production
- Labour saving technologies should be develop and introduce to farmers
- The possibilities of increasing rice farms size to increase production should be explore

Way forward

- Planning
 - Complete draft paper 4 by June 30
 - Thesis compilation, June 30
 - Thesis defence, December 1, 2014
- Expected outputs
 - Paper 1 and paper 2 accepted for publication
 - Paper 3 and paper 4 (Under review)
 - One PhD book edited
 - Public defence of PhD

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Thank you!



Merci!