



Dynamics of Livelihood Strategies of Smallholder Rubber Farmers in Southwest China

Haowen Zhuang*, Shaoze Jin and Hermann Waibel
Leibniz Universität Hannover, Germany

Background

- Rubber plantation has expanded dramatically in Xishuangbanna, Southwest China since 2000s driven by rising rubber price (Chen H&Yi Z-F et al., 2016; Jianchu, Xu, et al., 2005).
- Rubber expansion results in significant increase in small-scale rubber farmers income (Inga Häuser& Konrad Martin, 2015).
- Smallholder rubber farmers are highly dependent on rubber cultivation and become vulnerable to price shocks.
- However, rubber price fluctuates since 2011 until now (Mundi index, 2018).
- Meanwhile, increasingly off-farm labor market are emerging in Southwest, China (Otsuka, 2013; Wang et al., 2016).

How smallholder rubber farmers adjust their livelihood strategies to face the challenges and keep constant income?

What are differences of the livelihood strategies in 2012 and 2014?



Figure 1. Price fluctuations of natural rubber

Source :Mundi Index, 2018.

Objectives

- To classify the livelihood strategies in XSBN in 2012 and 2014.
- To analyze the changes of livelihood strategies in 2012 and 2014 across income quantiles.
- To identify the determinants of household livelihood strategies and their changes.
- To determine the factors that influences livelihood strategies mobility.

Data

Panel data from socioeconomic survey of smallholder rubber farmers in Xishuangbanna(2013/2015)

- Stratified random sampling method**
 - Stratified by rubber planting per capita
 - Taking geographical location into account
- Research samples**
 - 612 households < 42 villages < 8 townships < 3 counties
- Household questionnaire**
 - Household characteristics
 - Rubber production
 - Crop & Livestock production
 - Off-farm activities

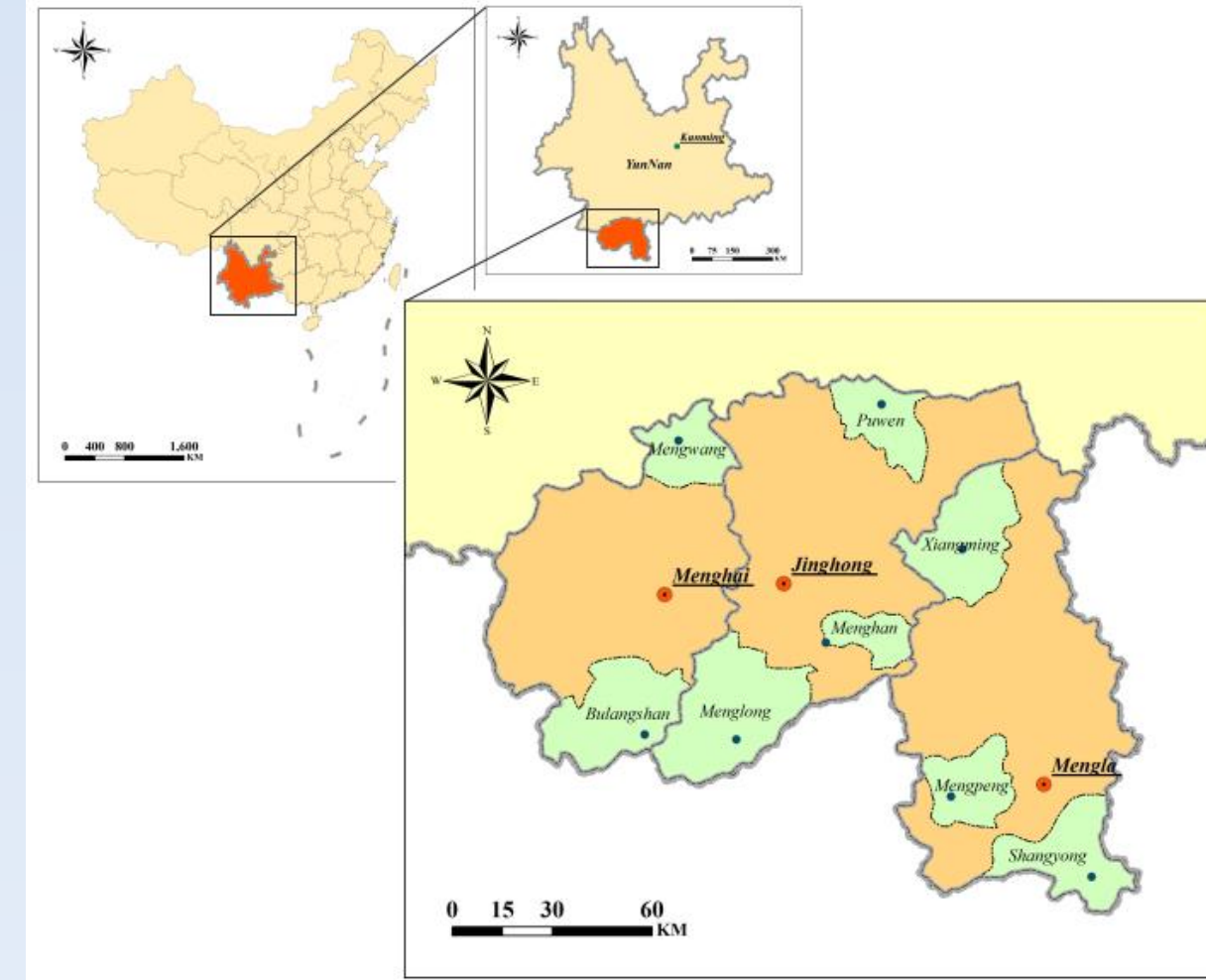


Figure 2. The location of research area and sample villages

Methodology

Methodology 1: Cluster Analysis for classifying different livelihood strategies

11 Activity variables (Jiao, X. et al., 2017; Van den Berg, M., 2010)

- Land input (%)
 - Rubber
 - Traditional crop
 - Cash crop
 - Rent-out land
- Labor input (%)
 - Rubber family labor working days
 - Traditional crop family labor working days
 - Cash crop family labor working days
 - Wage working days
 - Self-employment days
- Asset - Average livestock value
- Other - Average Times of natural resources extraction

Methodology 2: Multinomial Logit model for the determinants of household livelihood strategies

$$LS_{it} = \alpha_0 + \alpha_1 LS_{it-1} + \alpha_2 H_{it} + \alpha_3 N_{it} + \alpha_4 P_{it} + \alpha_5 F_{it} + \alpha_6 S_{it} + \alpha_7 Oth_{it} + \varepsilon_{it}$$

- LS_{it} : Livelihood strategies in 2014
- LS_{it-1} : Livelihood strategies in 2012
- H_{it} : Human capital, P_{it} : Physical capital
- N_{it} : Natural capital, F_{it} : Financial capital
- S_{it} : Social capital, Oth_{it} : Other household characteristics

Methodology 3: Ordered logit model for the factors influence mobility among livelihood strategies

$$Y_i^* = \beta X_{it-1} + u_i; Y_i = j \text{ if } C_{j-1} < Y_i^* < C_j \text{ where } i = 1, 2, 3, \dots, N; j = 1, 2, 3, \dots, p;$$

and C_1, C_2, \dots, C_j are unknown cut-off points for each category.

- Y_i is the livelihood movement category of the i^{th} household. It takes ordered values on 0, 1, 2.
- 0: household livelihood strategy moves downward from remunerative strategy to less remunerative strategy.
- 1: household livelihood strategy stays in the same income quantiles.
- 2: household livelihood strategy moves upward from less remunerative strategy to remunerative strategy.

Summary

- Significant livelihood strategy changes in 2012 and 2014
 - 4 major livelihood strategies in 2012 and 2014 respectively
 - Rubber cum traditional crop only exists in 2012;
 - A new livelihood strategy, rubber-dominated with wage employment, is being adopted in 2014.
- Livelihood strategy changes
 - 41% of household has moved downward from higher welfare levels to lower welfare levels;
 - 25% of household has shifted upward from lower welfare groups to higher welfare level.
- Determinants of livelihood strategy choices
 - The livelihood strategy clusters in 2012 are positively associated with their respective clusters in 2015;
 - Land certificate or forest land certificate is significantly with more diversified livelihood strategies;
- Factors causes livelihood strategy changes
 - Share of harvesting land is positively associated with the upward mobility and negatively associated with downward mobility implying that household with more rubber harvesting land will engage less remunerative livelihood strategy.

Selected results

Table 1. Cluster results and livelihood strategies transition (% of household)

Categories	Absolutely Rubber-Dominated (2014)	Rubber Cum Traditional Crop (2014)	Rubber Cum Cash Crop (2014)	Most Diversified (2014)	Absolutely Rubber-Dominated with Wage Employment (2014)	Total for 2012	Move-out
Absolutely Rubber-Dominated (2012)	14,69	-	4,13	3,47	11,88	34,16	19,47
Rubber Cum Traditional Crop (2012)	3,14	-	2,81	13,53	3,80	23,27	23,27
Rubber Cum Cash crop (2012)	2,81	-	11,06	3,30	1,49	18,65	7,59
Most Diversified (2012)	1,49	-	4,62	17,66	0,17	23,93	6,27
Absolutely Rubber-Dominated with Wage Employment (2012)	-	-	-	-	-	-	-
Total for 2014	22,11	-	22,61	37,95	17,33	100,00	-
Move-in	7,43	-	11,55	20,30	17,33	-	-

Table 2. Livelihood strategies transition among different welfare levels(% of household)

Welfare groups and Livelihood strategies in 2012 and 2014	2014				Upward
	Absolutely rubber-dominated	Absolutely rubber-dominated with wage employment	Most diversified	Rubber cum cash crop	
Low Rubber cum cash crop	0,03	0,01	0,03	0,11	0,15
Middle Absolutely rubber-dominated	0,15	0,12	0,03	0,04	0,07
High Rubber cum traditional crop	0,03	0,04	0,14	0,03	0,03
Very high Most diversified	0,01	0,00	0,18	0,05	-
Downward	0,19	0,04	0,18	-	-

Table 3. The determinants of livelihood strategy choice by Multinomial logit regression

Variables	Rubber Cum Cash Crop (2014)		Most diversified (2014)		Absolutely Rubber-Dominated with Wage Employment (2014)	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Household strategy in 2012						
Rubber Cum Traditional Crop (2012)	1,15**	0,51	3,12***	0,5	0,71	0,45
Rubber Cum Cash Crop (2012)	2,02***	0,48	1,26**	0,51	-0,25	0,51
Most Diversified (2012)	1,06*	0,6	2,91***	0,56	-2,13*	1,12
Human Capital						
Female head (1= yes; 0 = No)	-0,75	0,56	-1,58***	0,56	-0,52	0,56
Natural capital						
Total land area(Ha)	0,08	0,05	0,1**	0,04	-0,01	0,05
Share of rubber land	-0,04***	0,01	-0,03***	0,01	0,001	0,01
Share of harvesting land	-0,01**	0,01	-0,01*	0,01	-0,01**	0,01
Cultivation land certificate (1= yes; 0 = No)	0,65*	0,37	0,92**	0,37	-0,22	0,37
Forest land certificate(1= yes; 0 = No)	1,04**	0,43	1,35***	0,45	0,36	0,41
Altitude(MASL)	0,004***	0,001	0,004**	0,001	-0,002	0,002
Physical capital						
No. of motor	-0,64**	0,32	-0,42*	0,24	-0,29	0,23
No. of truck	0,45	0,65	-1,23*	0,72	-0,2	0,73
Livestock value(1000USD)	0,12	0,11	-0,22**	0,11	-0,21	0,19
Financial capital						
Public transfer(1000USD)	-0,17	0,37	-0,14	0,33	-0,9*	0,47
Amount of credit(1000USD)	-0,07**	0,03	-0,03**	0,01	-0,01	0,01
Social capital						
Received cash gift(1000USD)	0,11	0,13	0,36***	0,12	0,14	0,1
Household head characteristics	✓					
Rubber characteristics	✓					
Other characteristics	✓					

Table 4. The factors influences livelihood strategies mobility by Ordered logit regression

Variables	Ordered logit		Marginal effect (Downward mobility) n = 248		Marginal effect (No mobility) n = 205		Marginal effect (Upward mobility) n = 159	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Human Capital								
Household Labor (15-64 years old)								
average age (year)	-0,11	0,07	0,02	0,01	-0,004	0,003	-0,02	0,01
average age2 (year)	0,002*	0,001	-0,0003*	0,0002	0,0001*	0,00004	0,0003*	0,0002
Natural capital								
Share of rubber land	0,01**	0,01	-0,002**	0,001	0,0005*	0,0002	0,002**	0,001
Share of harvesting land	-0,02***	0,004	0,004***	0,001	-0,001***	0,0002	-0,003***	0,001
Altitude	-0,002**	0,001	0,0004**	0,0002	-0,0001**	0,00003	-0,0003**	0,0001
Physical capital								
House wealth(1000USD)	-0,003*	0,002	0,001*	0,0004	-0,0001*	0,0001	-0,0005*	0,0003
Financial capital								
Received cash gift(1000USD)	0,05*	0,03	-0,01*	0,01	0,002	0,001	0,01*	0,01
No. of mobile phones	-0,11*	0,07	0,02**	0,01	-0,004**	0,003	-0,02*	0,01
Household head characteristics	✓							
Rubber characteristics	✓							
Other characteristics	✓							

Notes for table 3 and 4
* Only reporting significant variables,
*** significant at 1%, ** significant at 5%, * significant at 10%