

Value Chain Myths and Facts: The Domestic Onion Value Chain in Senegal

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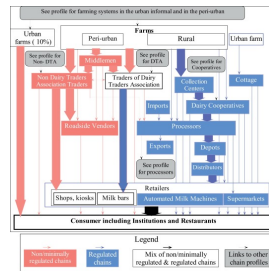
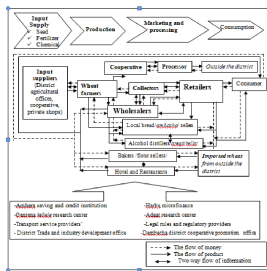
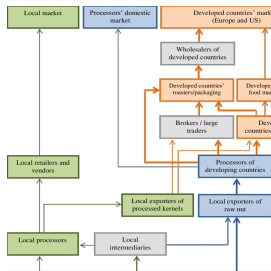
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Motivation

- Traditional approaches improving agricultural productivity in developing countries tend to focus on interventions at the **smallholder level**
- Recently shift towards a focus on the **“value chain”** as a whole
- What is a **“value chain”**?
 - “Range of goods and services necessary for an agricultural product to move from the farm to the final customer or consumer.” (De Brauw and Bulte 2021)

In practice... Value chains can be complicated objects.

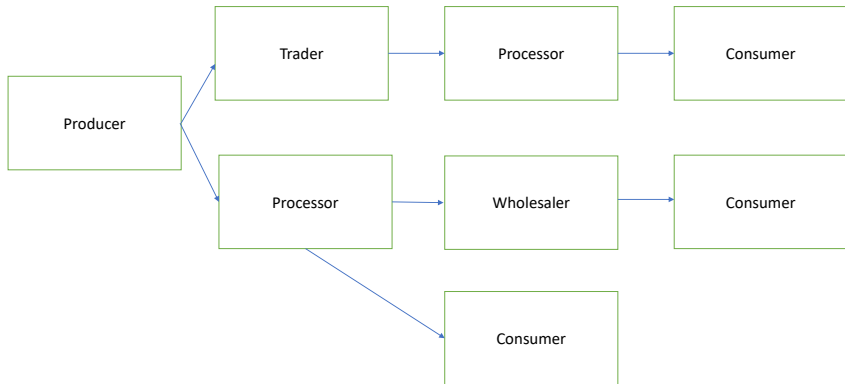


Sources: Noni et al. (2017), Addis and Mengesha (2020), Kiambi et al. (2018)

Key Question

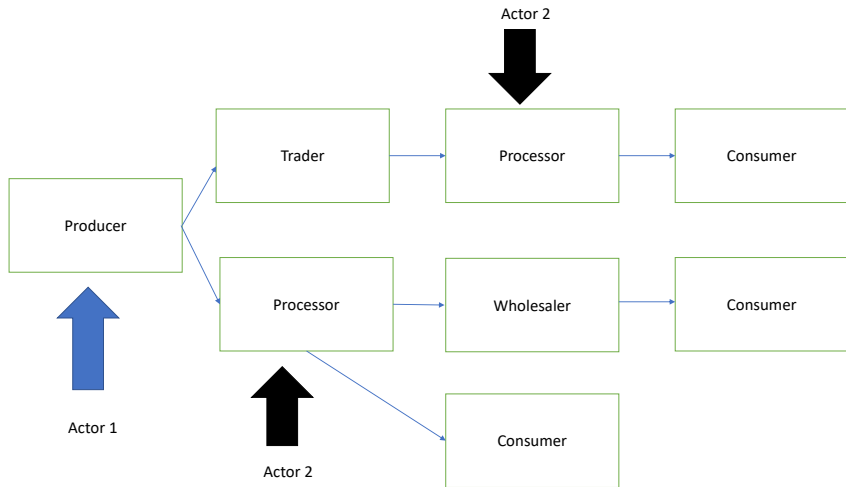
- With limited resources, how do we choose where to study and intervene?
- Argue here for a pathways approach

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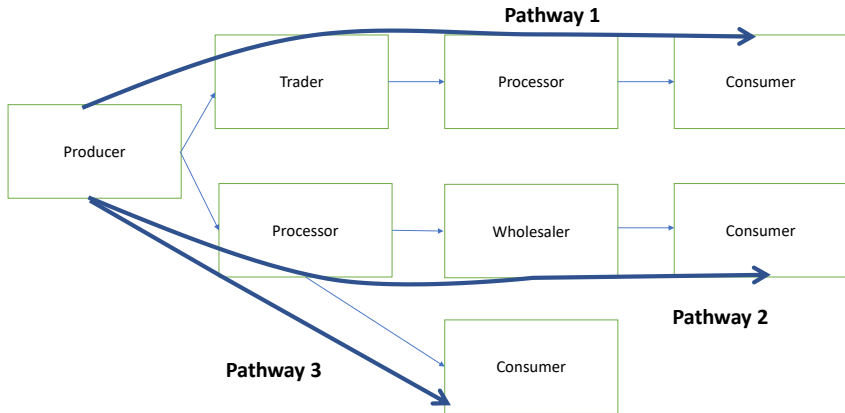


Value Chain

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To fix terms:



A Pathways Approach to Characterizing Value Chains

- Locating people and goods
 - Which pathways are most important from a food system perspective?
 - Which pathways have the most participation from smallholders?
- Identifying issues and opportunities
 - Do some pathways have better functionality than others?
- Understanding Dynamics
 - Is there interplay between activity in different pathways?

This Paper

Goals

- 1 Characterize structure and functionality of value chains through pathways approach, using as a case study the domestic onion value chain in Senegal
- 2 Use framework to test some common conceptions of domestic value chains in developing countries

Common Conceptions

- ① Most goods are transacted through complex pathways with many intermediaries.
- ② Pathways structures are relatively rigid, with repeated transactions between actors of the same type
- ③ Smallholders have limited access to less complex pathways
- ④ There is more non-competitive behavior, and limited price pass if more complex pathways.

Summary of Findings

- ① Most goods are transacted through complex pathways with many intermediaries.
 - False. Less than 31% of total volume moves through pathways with > 1 intermediary between the producer and the wholesaler/further downstream user.
- ② Pathways structures are relatively rigid, with repeated transactions between actors of the same type
 - False. Many actors participate in multiple pathways depending on the region and time of season.

Summary of Findings (2)

- ③ Smallholders have limited access to less complex pathways
 - Likely True. Production volume is highly correlated with participating in the least complex pathways.
- ④ There is more non-competitive behavior, and limited price pass if more complex pathways.
 - Mixed. Farmers receive a clear premium for quality regardless of pathway. However, intermediaries in complex chains frequently cheat producers.

Note: Today's results have a strong producer focus.

Outline

- 1 Introduction
- 2 Literature and Contribution
- 3 Context and Data
- 4 Results: Structure
- 5 Results: Functionality
- 6 Conclusion

Literature

- Classic value chain conceptions from IO literature may not capture multiplicity and heterogeneity of chains in developing countries
 - Structure-conduct-performance paradigm of Bain (1959)
 - Diagrams inspired Porter (1985)
- To deal with this, most literature focuses on:
 - Capturing carefully one type of actor (especially intermediaries) (Ambler et al. (2022), Bergquist and Dinerstein 2020, Sanou et al. 2019, many others)
 - Capturing one pathway of the value chain really carefully (Delgado et al 2017 on food loss, or various case studies)
 - Capturing “everything” /many actors, but not necessarily clearly differentiating between pathways or their importance (Minten et al. 2018)

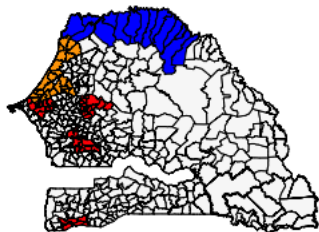
Highlights our approach

- Limited definition of “value chain actor”
 - Notably, not including other stakeholders who influence value chain but don't “touch” goods
- Define structure based on *series* of interactions between actors, recognizing that actors may operate different ways within different pathways
- Identification of Pathways comes from 3-actor sequences
 - This will not *always* allow for unique identification of pathways, but it might to the extent that these differences matter
- Emphasis on actual volume movements along the chain

Content Onion Production in Senegal

- Onion is a key locally produced (over 400,000 tonnes annually) and consumed crop (Rank 5th in onions consumed/person)
- Mainly grown in 2 regions: Senegal River Valley and the Niayes
- Very seasonal supply, partially due to storage issues
- Net importer, but ban during the peak of onion season

Onion Value Chain in Senegal



Value Chain Actors

- Producers: mostly smallholders concentrated in 2 regions
- Rural Coaxers: Local collectors that gather and sell on consignment at rural collection points
- Banabanas: buy from farmers directly or at collection points and bring to urban markets
- Urban coaxers: Similar to rural coaxers but at urban markets
- Wholesalers/Semi-wholesalers: Buy in bulk and then sell downstream
- Retailers/Consumers/Other: End users (Abstract from this last link for this analysis)

Important “Peculiarities”

- Production is concentrated in 2 regions
- Very clear spot markets at local collection points and urban markets
- Don't see much contracting or resource provision from downstream actors (though did not necessarily know this ex ante)

Data Collection Process

- KII Interviews: to understand the details and possible configurations in value chains
- Actor Survey: Interviewed each actor about all major transactions, also various opinions and perceptions (Winter/Spring 2021)
 - In practice, had to re-survey some actors, so smaller samples (Fall 2022, proof of concept)
 - End up with about 648 producers, 45 Rural Coaxers (later 39), 114 Banabanas (later 79), 25 Urban Coaxers, 27 Wholesalers
- Transaction Survey: In order to capture some details with price pass-through, negotiation, etc. (end up with around 250-300 transactions for producer sellers and banabana sellers, combining some also reported via actor survey)

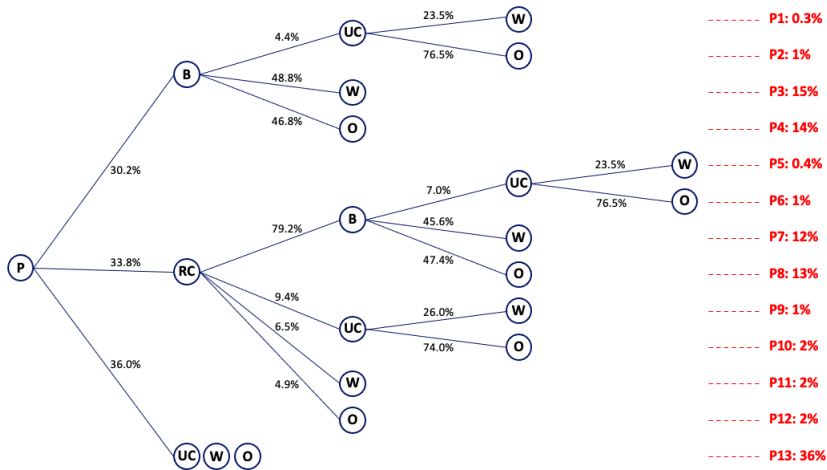
Sampling and Weighting

- Wanted to capture major activity, so designed geographical clusters of production and picked 5 with most onion production (using national statistics)
- Producers randomly chosen from random villages in each cluster
- Tried to get all rural coaxers and banabanas at local collection points/other formal and informal markets
- Separately chose random markets in major market centers to get other actors
- Weighted for representativeness of banabanas and then ratios up to national production ratios for regions

Results: Structure

Does most of the volume pass through the most complex chains?

Less than 1/3 of the volume goes through chains with multiple intermediaries between producer and wholesaler



Some Observations

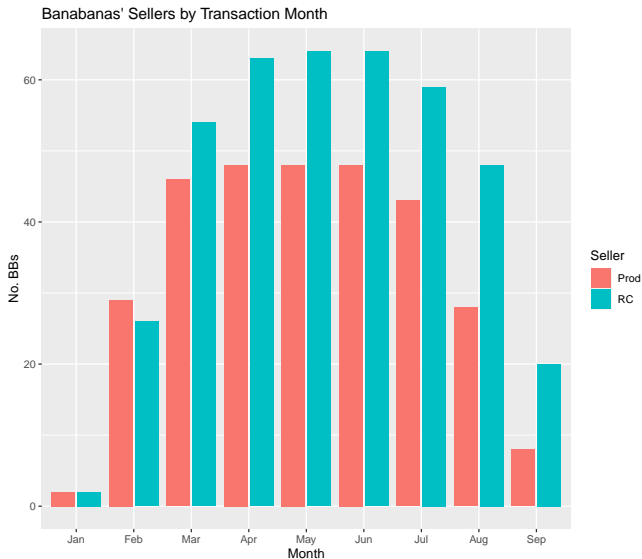
- Producers don't always recognize actor type at urban markets
- The most complex chain with all actors is less than 2% of all volume
- Much more complex set of downstream pathways than predicted by experts, but if we group into broad buckets based on the top of the chain, it broadly matches

Are pathways rigid and inflexible?

Pathways can adjust to spatial heterogeneity

- Farm-gate transactions (with banabanas) are much more common in the Niayes than in Senegal River Valley
- Sales at urban markets are much less important for farmers in the Niayes than in Senegal River Valley
- Rural coaxers in the Niayes are much less likely to connect directly with urban coaxers than rural coaxers in SRV
- Why? Cheaper for banabanas to go to farmgate in Niayes due to proximity to urban centers, and often fill trucks before getting to SRV
- In SRV, price is measured by bag rather than kg, so more of a possible benefit to go to market and shop around

Pathways can respond to temporal heterogeneity



► Banabanas who sell to both

Many buyers source from/sell through multiple actor types within a season

Source/Buyer Types	% Prod.	% RC	% Bana.	% UC
1 Source, 1 Buyer	92.5%	52.6%	19.2%	28.0%
1 Source, 2+ Buyer	7.5%	47.4%	32.1%	56.0%
2+ Source, 1 Buyer			15.4%	0.0%
2+ Source, 2+ Buyer			33.3%	16.0%
N	641	39	79	25

Can Smallholders access complex chains?

Many Smallholders say that they can change between buyer types

	All	RC	Bana	UC/W/O
Can Choose Buyer Type	0.49 (0.03)	0.51 (0.04)	0.41** (0.04)	0.51 (0.06)
Did/Will Change Type	0.21 (0.02)	0.28** (0.04)	0.17 (0.03)	0.18 (0.05)
Did/Will Change Location	0.14 (0.02)	0.18* (0.03)	0.10* (0.02)	0.14 (0.04)
N	648	302	278	133

Stars denote being significantly different from "All" column. * indicates, $p < 0.1$, ** indicates $p < 0.05$ and *** indicates $p < 0.01$.

However, smallholders who sell farther downstream do look different

	All	RC	Bana	UC/W/O
Any School	0.53 (0.03)	0.56 (0.04)	0.47* (0.04)	0.63** (0.05)
Experience (Years)	17.6 (0.66)	17.0 (1.02)	17.4 (0.97)	19.1 (1.44)
Land Area Owned (Hectares)	3.22 (0.20)	2.91 (0.25)	3.45 (0.32)	3.67 (0.49)
Production in 2019-2020 (Tonnes)	11.7 (1.13)	9.85* (1.45)	11.3 (1.21)	22.6*** (3.79)
Can't Afford Better Seeds	0.52 (0.03)	0.53 (0.04)	0.52 (0.04)	0.43* (0.06)
Use Credit to Buy Seeds	0.26 (0.02)	0.23 (0.04)	0.28 (0.04)	0.35** (0.06)
Hired Ag. Labor	0.53 (0.03)	0.54 (0.04)	0.49 (0.05)	0.70*** (0.05)
Easy to Find out Local Onion Price	0.64 (0.03)	0.65 (0.04)	0.61 (0.04)	0.72* (0.05)
N	648	302	278	133

Stars denote being significantly different from "All" column. * indicates, $p < 0.1$, ** indicates $p < 0.05$ and *** indicates $p < 0.01$.

Volume does seem to be highly correlated with pathway choice

	<i>Dependent variable:</i> Producer Sells to:					
	RC (1)	BB (2)	UC/W/Other (3)	RC (4)	BB (5)	UC/W/Other (6)
Sales Volume (Tonnes)	-0.005 (0.003)	0.001 (0.005)	0.010*** (0.001)			
Sales Volume (Quartile 2)				-0.039 (0.086)	0.103 (0.084)	-0.025 (0.059)
Sales Volume (Quartile 3)				0.051 (0.047)	0.097* (0.041)	-0.064 (0.054)
Sales Volume (Quartile 4)				-0.109 (0.116)	0.083 (0.105)	0.205* (0.090)
Cluster FE	Y	Y	Y	Y	Y	Y
Observations	648	648	648	648	648	648
Weighted Mean Dep. Var.	0.484	0.412	0.242	0.484	0.412	0.242
R ²	0.115	0.073	0.148	0.111	0.078	0.101
Adjusted R ²	0.108	0.066	0.141	0.101	0.068	0.091

* indicates, $p < 0.1$, ** indicates $p < 0.05$ and *** indicates $p < 0.01$.

Results: Functionality

Is there are a quality-price premium for producers?
And does this vary by chains?

Farmers understand they should receive a higher price for better onions

Variable	Good	Average	Bad
Local Min. Price	217.8 (6.04)	180.5*** (4.6)	138.8*** (12.8)
Local Max. Price	258.7 (12.1)	202.1*** (4.74)	165.1*** (12.6)
N	317	241	33
Dakar Min. Price	282.1 (6.74)	252.8*** (5.85)	172.3*** (15.4)
Dakar Max. Price	326.7 (9.10)	276.1*** (6.03)	198.3*** (14.0)
N	289	222	31

Producers receive a price premium for quality regardless of pathway

	<i>Dependent variable:</i>			
	I(Quality==Good) (1)	(2)	Price (FCFA/kg) (3)	(4)
I(Quality==Good)		29.357*** (6.152)		31.796* (14.194)
I(Buyer==Banabana)	0.031 (0.056)		6.83 (13.857)	18.14 (25.860)
I(Buyer==UC/ Wholesale/ Other)	0.157 (0.132)		45.702** (15.211)	47.947** (16.682)
I(Quality==Good)* I(Buyer==Banabana)				-14.167 (24.818)
I(Quality==Good)* I(Buyer==UC/ Wholesale/ Other)				-6.395 (24.887)
Time of Season FE	Y	Y	Y	
Cluster FE	Y	Y	Y	
Observations	257	257	257	257
Mean Dep. Var.	0.861	231.6	231.6	231.6
P-val Diff. Prem. (RC vs BB)				0.527
P-val Diff. Prem. (RC vs UC)				0.773
P-val Diff. Prem. (BB vs UC)				0.501
Adjusted R ²	0.055	0.270	0.274	0.279

Banabanas receive a price premium for quality regardless of downstream seller

	<i>Dependent variable:</i>			
	I(Quality==Good) (1)	(2)	Price (FCFA/kg) (3)	(4)
I(Quality==Good)		54.698*** (4.663)		62.589** (21.640)
I(Buyer==Wholesaler/Other)	0.048 (0.065)		-10.244 (13.566)	-7.583 (4.303)
I(Quality==Good)* I(Buyer==Urban Coaxer)				-8.651 (21.342)
Year FE	Y	Y	Y	Y
Period of Season FE	Y	Y	Y	Y
Region FE	Y	Y	Y	Y
Observations	283	283	283	283
Mean Dep Var.	0.603	253.6	253.6	253.6
P-val Diff. Prem. (UC vs. Whole/Other)				0.702
R ²	0.220	0.311	0.207	0.314
Adjusted R ²	0.195	0.288	0.180	0.286

* indicates, $p < 0.1$, ** indicates $p < 0.05$ and *** indicates $p < 0.01$.

Results: Functionality

Are producers in longer chains subject to less competitive behavior?

Rural coaxers cheat producers, though maybe not as much as they think

	RC's Cheat (Indicator)	RC's Cheat (Freq.)	Prod Say RC's Cheat (Freq.)	Self Cheated (Freq.)
Prod Say:	75.4% (2.38)	66.9% (2.41)	65.4% (2.76)	48.8% (2.79)
N	648	349	371	415
RCs Say:	57.8%** (7.45)	26.9%*** (5.52)	30.7%*** (6.93)	
N	45	20	28	

Stars indicate the value in the second row is significantly lower than the value in the top row of the corresponding column in a weighted t-test of means. * indicates, $p < 0.1$, ** indicates $p < 0.05$ and *** indicates $p < 0.01$.

Rural Coaxers perceptions seem to suggest competitive behavior at local markets

	Price Increases	Price Constant	Price Decreases
# Bana increases	0.67 (0.07)	0.29 (0.07)	0.04 (0.03)
# Bana decreases	0.04 (0.03)	0.44 (0.07)	0.51 (0.08)
# RC decreases	0.27 (0.07)	0.67 (0.07)	0.07 (0.04)
# RC increases	0.09 (0.04)	0.71 (0.07)	0.20 (0.06)
N	45	45	45

Recap Results

(In this Setting)

- Value Chains can have complex structures, but a lot of the volume goes through relatively simple pathways
- Value chain structures can be flexible based on geographical and/or temporal fluctuations
- Smallholders likely lack access to the simplest value chain structures
- Despite this, we see a quality price premium for producers regardless of the chain in which they participate

Discussion

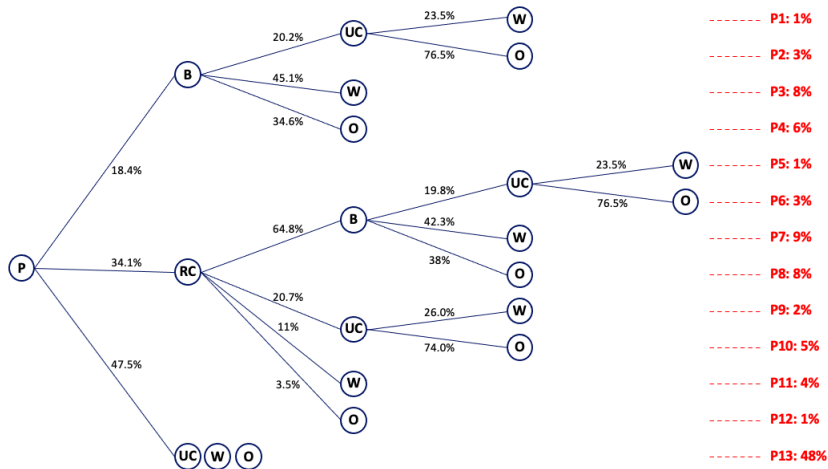
- As we do more surveys of value chains, pathways approach may be a helpful diagnostic in identifying where to focus and intervene
- In case of onions in Senegal, there is likely a trade-off between interventions that have the largest food systems impacts, and those that improve smallholder farmer livelihoods
- We also can identify relevant issues, such as cheating by incorrect price reporting in the longest chains
- But given the flexibility of value chain pathways, need to think really carefully about how such interventions may shift actors between pathways

Thank you!

Comments/suggestions much appreciated!

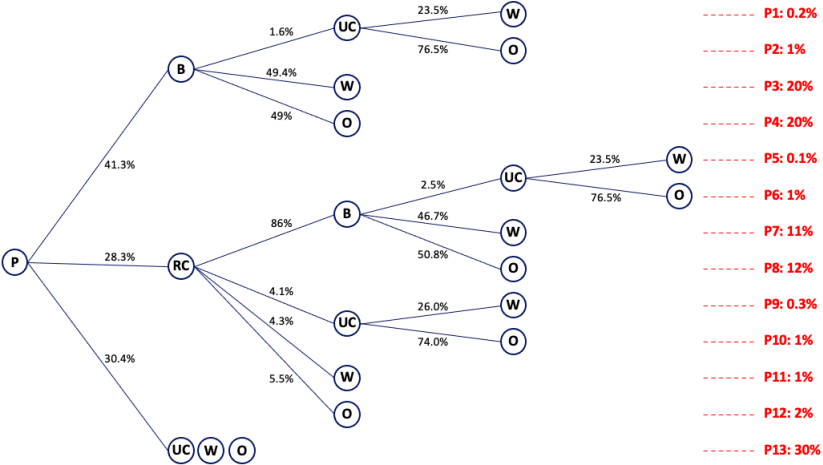
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SRV-Diagram



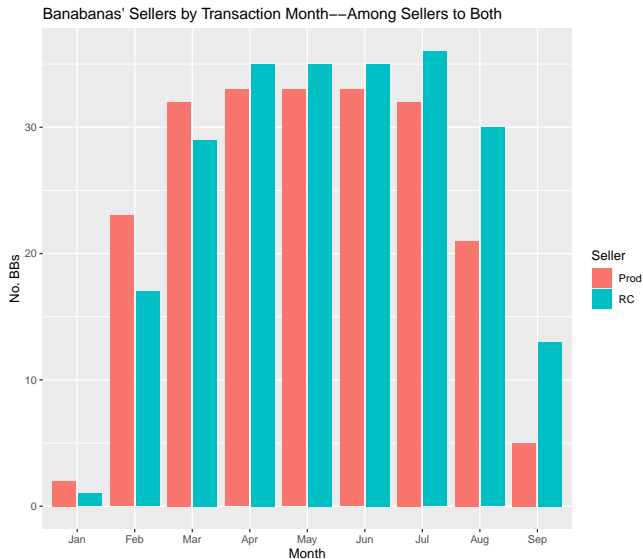
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Niayes–Diagram



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Shift Banabanas Selling to Both



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