Inclusive Agricultural Transformation in Odisha's Vegetable Value Chains

INCATA Final Workshop

Ben Belton & Sudha Narayanan,
IFPRI South Asia Office

February 4, 2026

RIMISP
Centro Latinoamericano para el Desarrollo Rural

Studying inclusive agricultural transformation

Working with: RIMISP, Michigan State University, Egerton University, International Food Policy Research Institute (IFPRI)

Transformation:

- Change in number and scale of VC actors over time
- Change in the behavior of VC actors

Inclusion:

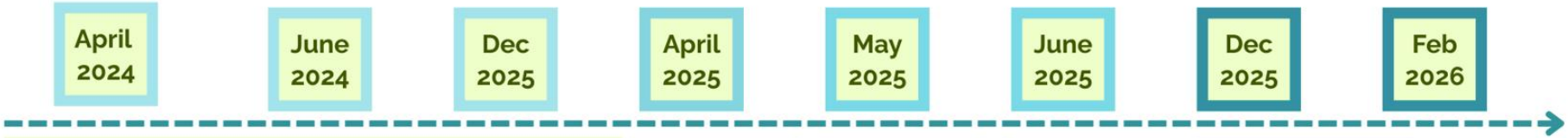
- Who participates (gender, caste, community)?
- On what terms (how do different groups participate, what benefits they derive)?

Clusters: Spontaneous and Organized (inclusion effects)

Key findings

- Vegetable farming gradual transformation as part of on-farm diversification strategies; commercial but at transitional stage of development in all segments (not dramatic boom like Kenya)
- Entry into vegetable farming enabled by irrigation access, most irrigation for veg from private sources
- Welfare effects of commercial smallholder vegetable farming positive; higher farm incomes, dietary diversity
- Symbiosis between spontaneous and organized vegetable farming clusters, variegated implications for inclusion
- Farming most inclusive VC segment, retail most inclusive off-farm segment, but highly differentiated terms of inclusion by gender, caste
- Complementary co-development of short and long vegetable supply chains
- Symbiosis among different VC actors (e.g., information, very little tied credit)

INCATA Project Timeline



Rapid Reconnaissance

Literature review and secondary data synthesis

No. of interviews: Inputs- 16, Farmer- 42, Wholesaler- 25, Retailer-45, Transporter- 9, Government- 24, NGO- 11, Others-5, Total- **178**

Sample district and block selection

- Purposive selection of 6 districts with contrasting socioeconomic & agroecological characteristics
- Stratified random selection of 4 blocks per district (2 high veg, 1 medium veg, 1 low veg)

Market Survey

- **Sample frame**: Listed all veg markets in selected blocks, all municipal veg markets in selected districts, 4 large 'terminal markets'
- **Sample size: 163** markets
- **Data collection Method:** Structured group interviews

Trader Survey

- **Sample frame**: Listing of **11,809** traders in 163 markets
- **Sample size: 1623** veg traders, Wholesaler- 384 Retailer - 1,239
- **Data collection Method**: Individual trader interviews

Input Survey

- **Sample frame**: 500 registered is from govt list of 1,870 plus, 139 unregistered from mkt listing in 24 blocks
- **Sample size**: **628** input suppliers
- **Data collection Method:** Individual input supplier interviews

Farmer & Community Survey

Case studies: Markets, Vegetable clusters

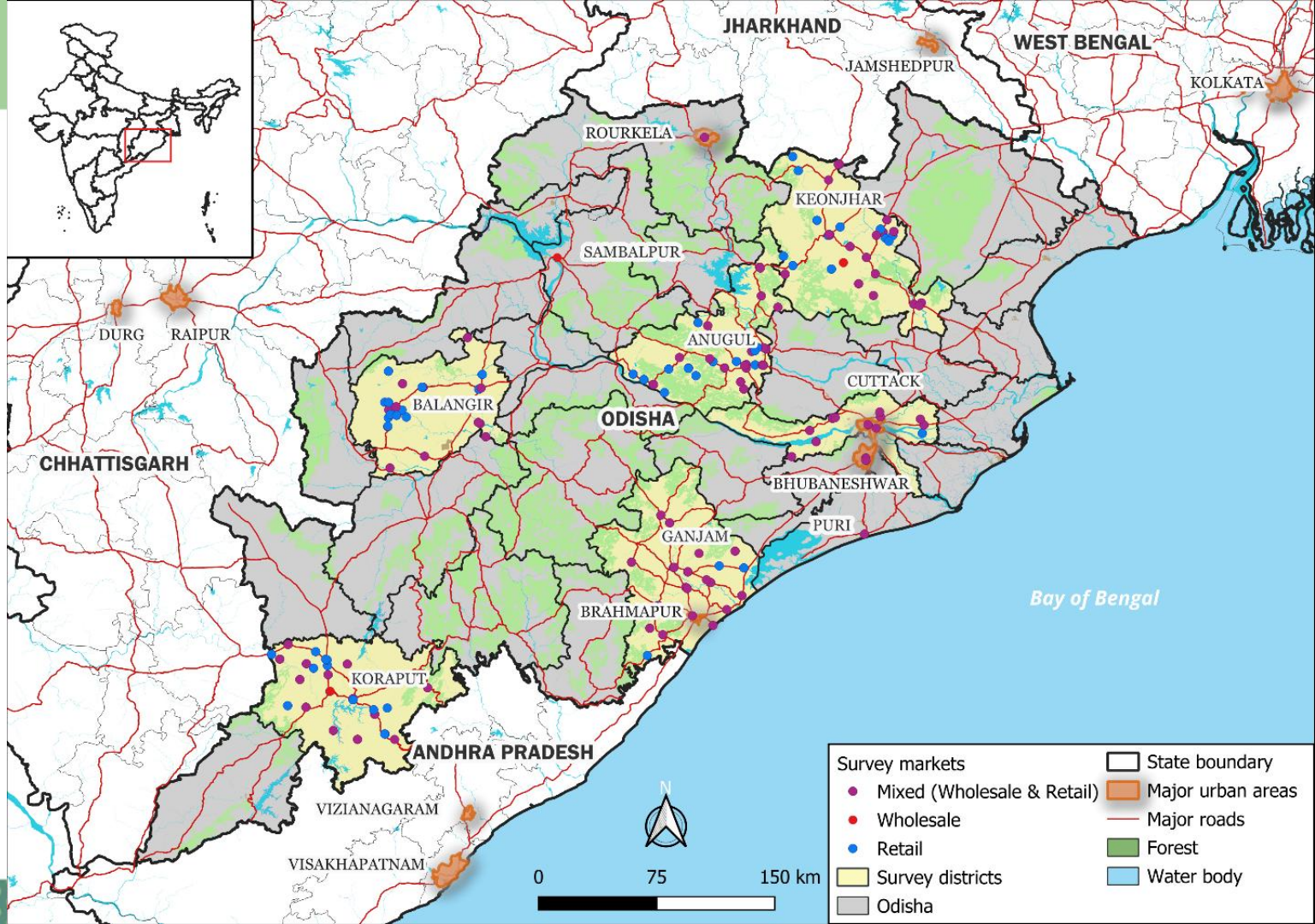
Farmer Survey

- **Sample frame:** Listing of **35,913** HH from 24 selected blocks (12 high; 6 medium; 6 low vegetable farm concentration)
- Stratified by veg and rice, randomly assigned modules within strata on production, income, last veg sale
- **Sample size: 3089** farmers Vegetable- 2109, Rice- 980
- **Data collection Method**: Individual farm interviews

Community Survey

- **Sample frame:** Selected randomly selected from 24 blocks
- **Sample size: 154** villages
- **Data collection Method:** Structured group interviews

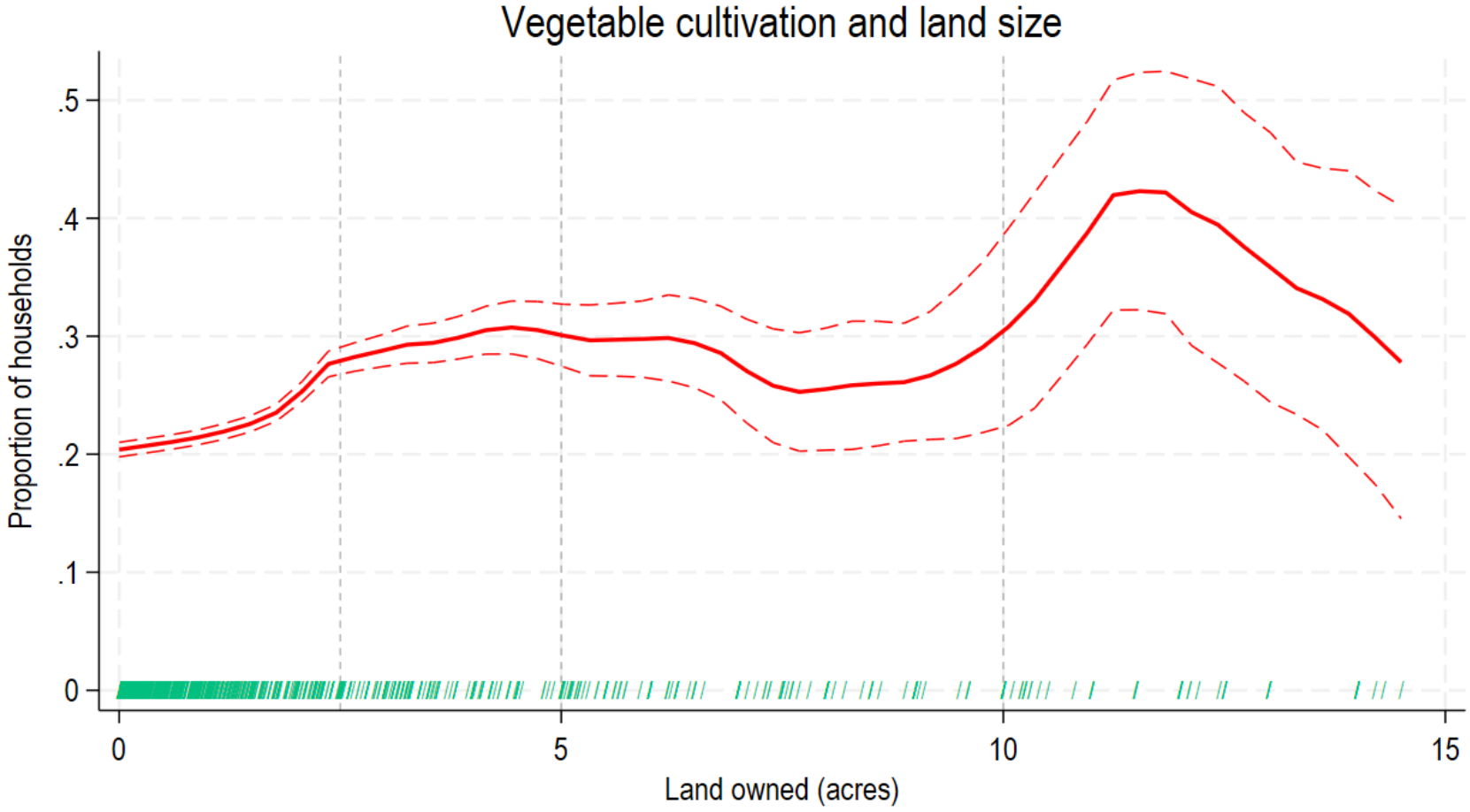
Study sites


JHARKHAND
WEST BENGAL
JAMSHEDPUR
KOLKATA
ROURKELA
KEONJHAR
SAMBALPUR
DURG
RAIPUR
ANUGUL
CUTTACK
BALANGIR
ODISHA
CHHATTISGARH
BHUBANESHWAR
PURI
GANJAM
Bay of Bengal
BRAHMAPUR
KORAPUT
ANDHRA PRADESH
VIZIANAGARAM
VISAKHAPATNAM
N
0
75
150 km
Survey markets
Mixed (Wholesale & Retail)
Wholesale
Retail
Survey districts
Odisha
State boundary
Major urban areas
Major roads
Forest
Water body

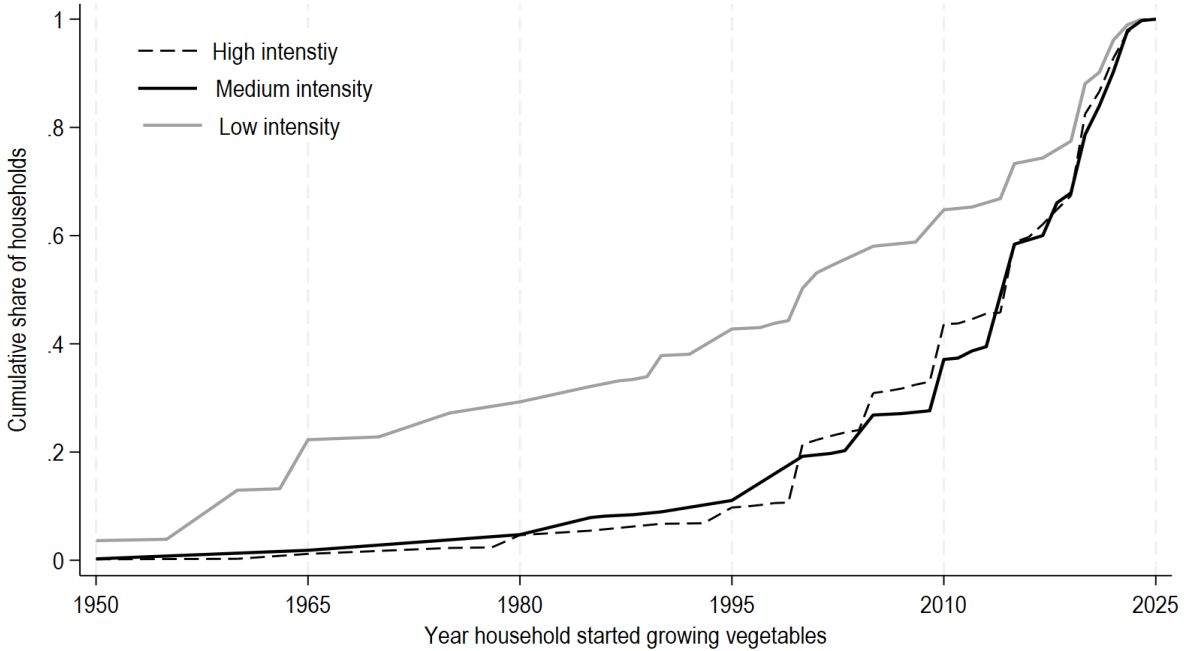
Who participates in vegetable farming & why?

- 69% of listed HH farmed in the past year, among which:
  - 95% grew paddy
  - 22% grew vegetables for sale (15% of all HH)
- 45% of HH have at least member who worked on vegetable farm
- Vegetable farmers have slightly higher prior socioeconomic status to non-vegetable farmers (education, caste, land etc)
- Vegetable farming is a smallholder activity (average landholding = 0.8 ha)
- Vegetable marketed surplus is high (74%) and gradually increasing

Inclusive of smaller landholders

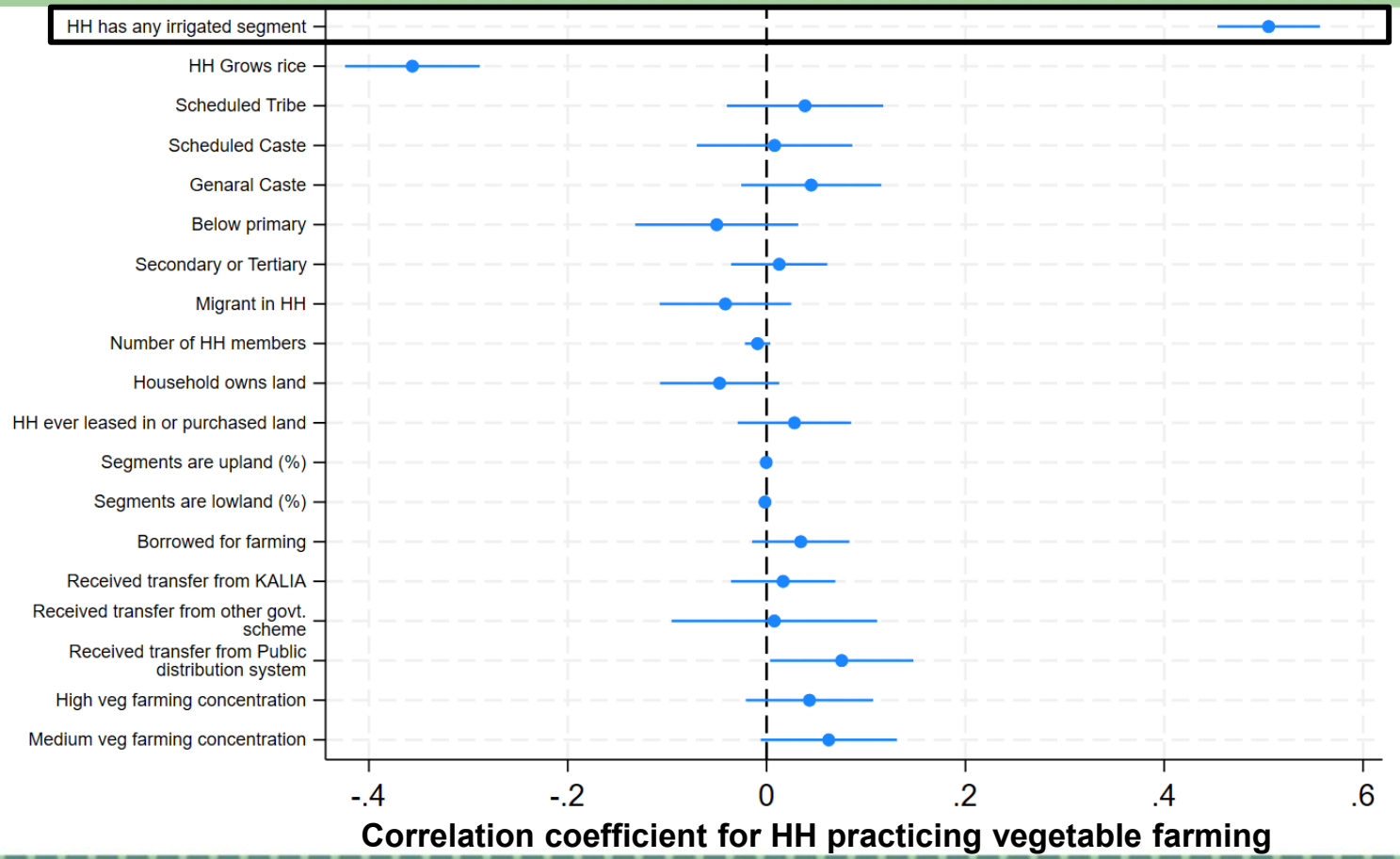


Recent growth in uptake has been more within clusters

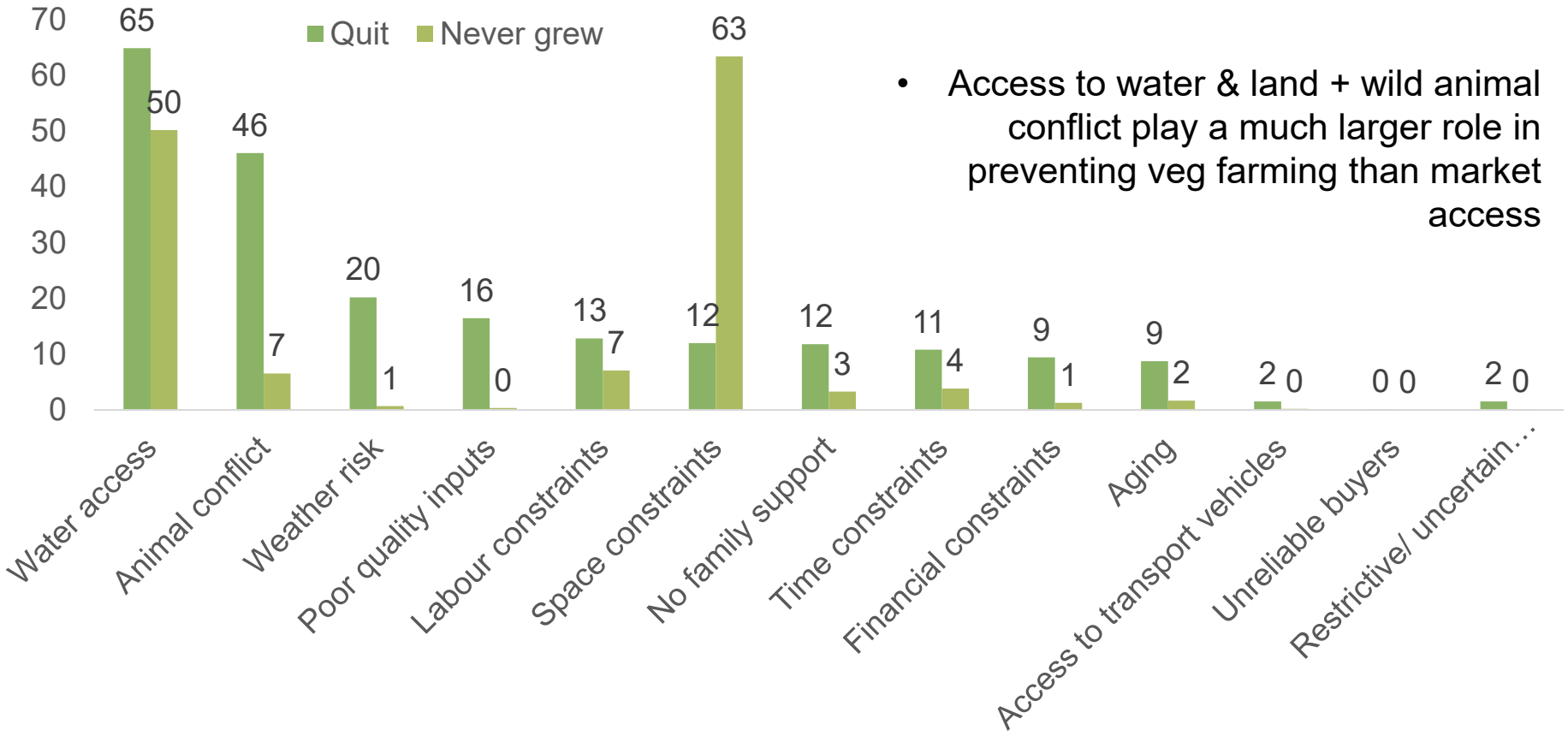


Correlation between starting year of farming and selling is 0.90

Water access is by far the most critical factor associated with entry into veg farming



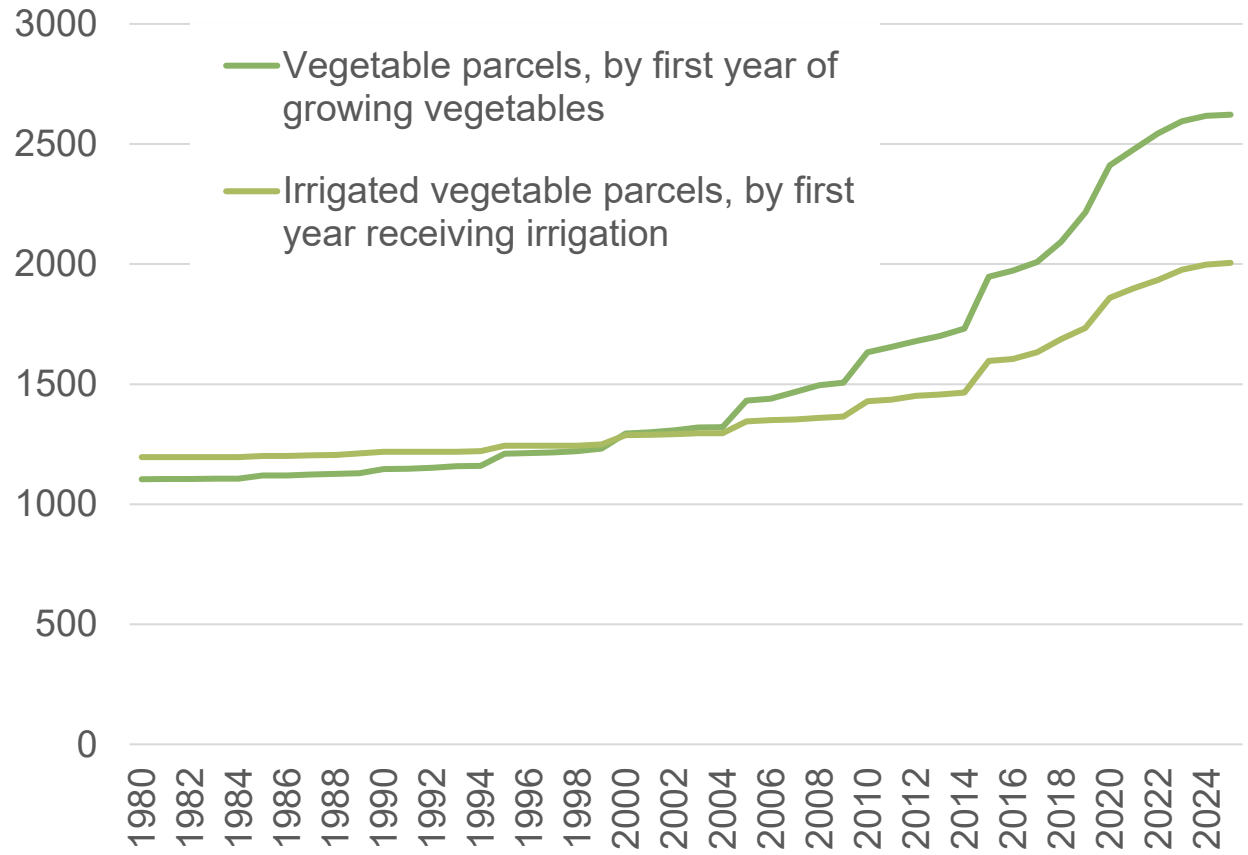
Why don't people grow vegetables?



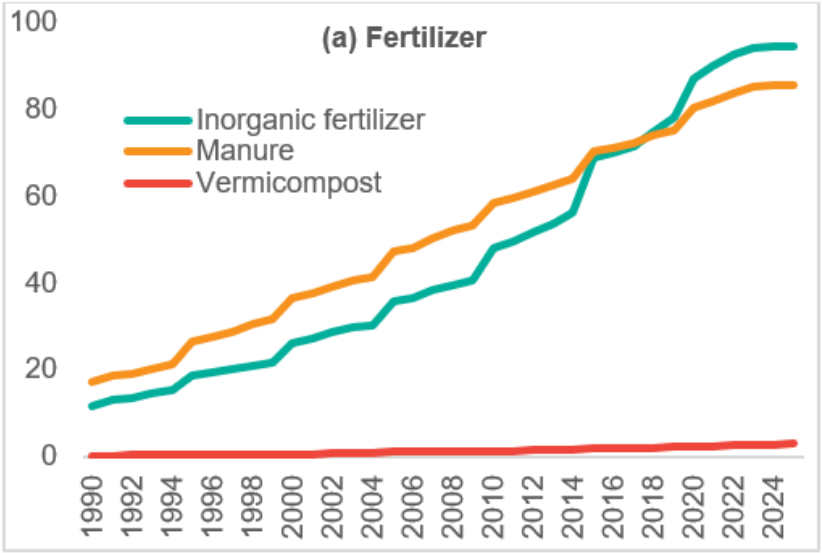
- Access to water & land + wild animal conflict play a much larger role in preventing veg farming than market access

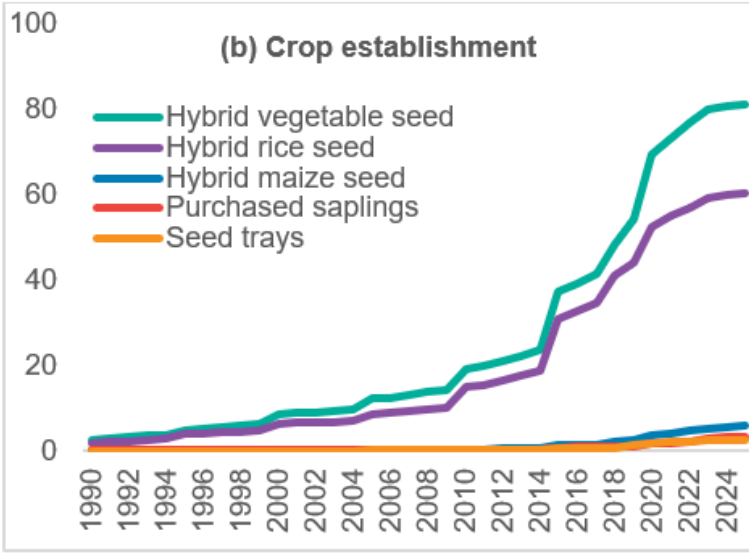
Vegetable adoption tracks irrigation access

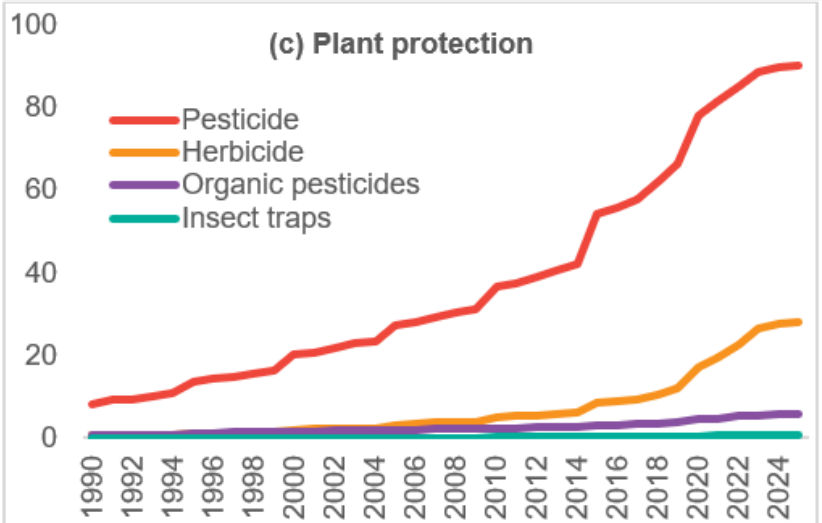
- Number of parcels of land with access to irrigation from 2010-2025 increased at 2X the rate from1980-2010
- Pvt irrigation grew nearly 2X faster that govt.
- Govt irrigation (lift irrigation & canals) mainly for rice
- Pvt irrigation (borewells and open wells) mainly for veg

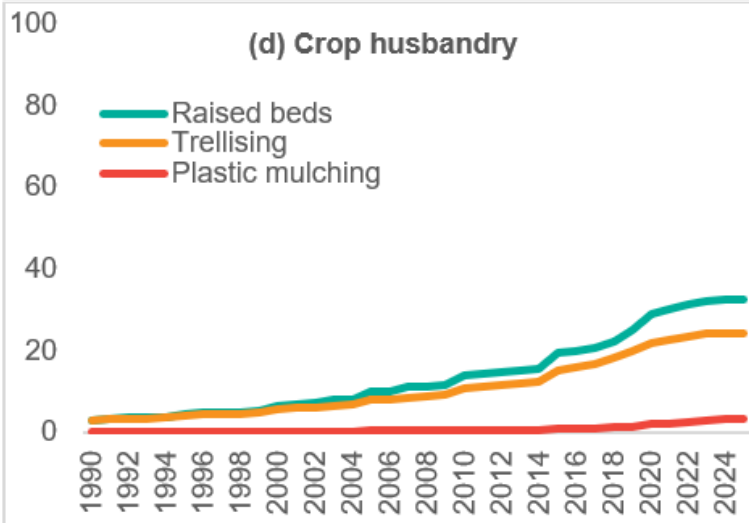


Uptick in technology adoption around 2015 tracks irrigation access









Positive welfare effects form smallholder vegetable commercialization

- Average vegetable cultivation area 0.2 ha, vs 0.6 ha rice
- Vegetable production costs/ha: 56% higher than rice ($700 vs $1095)
- Vegetable income/ha: 305% higher than rice: ($440/ha vs $1775)
- Vegetable farmers earn 24% higher total agricultural income than non-vegetable farmers, on average
- Vegetable farming households consume all types of vegetable significantly more frequently and have significantly higher HHDDS than non-vegetable farmers.
- No tradeoff between vegetable commercialization and home consumption

Spontaneous clusters: Three case studies

Working with: MICHIGAN STATE UNIVERSITY · EGERTON UNIVERSITY · IFPRI INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

Vegetable	Region (District)	Scale	Origin year	Area (as % of veg area)	Number of Key Informant Interviews
Eggplant	Kumundi (Nayagarh)	120 farmers, 80 acres	>100 years	50-70%	12 farmers. 3 traders, 1 input supplier, 4 farm workers,1 public official
Cauliflower	Jenapada (Cuttack)	400 farmers 250 acres	1978	83-100%	12 farmers, 3 traders, 3 input suppliers, 4 farm workers, 1 public official
Pointed gourd	Kuspangi (Cuttack)	> 130 farmers, > 100 acres	2017	71-82%	12 farmers, 7 traders, 2 input suppliers, 2 farm workers, 2 public officials

Diverse ways of becoming cluster

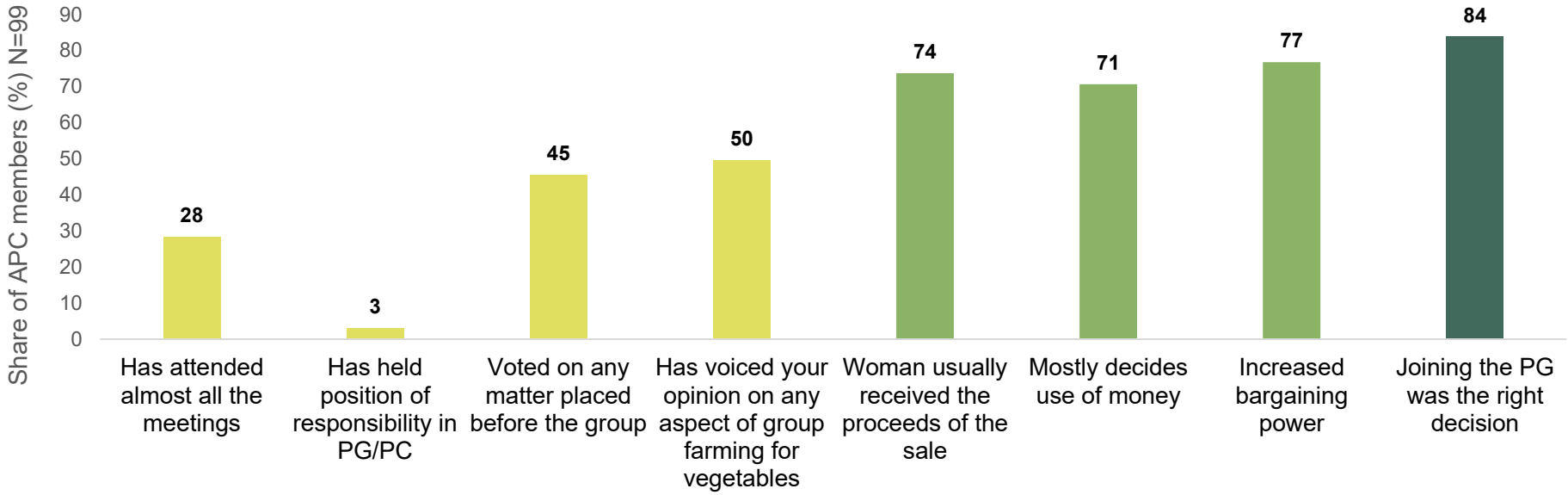
- Eggplant: Old crop, niche (>100 years), GI tag in 2023
- Cauliflower: Seeded by distant traders in 1978, became perennial from seasonal
- Pointed gourd emerged in 2017 : Co-evolution of trader-farmer relationship. Milk traders with networks in urban centers

Organized clusters:

The Agricultural Production Clusters (APCs) Program

- Established 2018
  - Built on SHGs, create Producer Groups (PGs)
  - Tribal/ marginalized castes women
  - Training in veg cultivation of winner crops, synchronization, collective input purchase, market linkages
  - Formation fo Farmer Producer Company (FPC)
- Field visits + Survey of 99 APC members
- Inclusive by design and transformative
  - Recognition as women farmers
  - Access to government programs
  - Increase in voice and agency

Benefits of APC participation



- Only 4% don't wish to continue (time constraints, for example)
- **Motivation to continue**: Learning new techniques, Expansion in area under vegetables, increase in yield, collective access to inputs, better prices, enjoy working together in a group

Some lessons

- Spontaneous clusters can reinforce historical inequities
  - Women confined to work on farms (harvesting, etc.), no executive agency
  - Marginalized castes unable to lease in land from landed castes
  - Skill gatekeeping

    "If we teach them how to cultivate cauliflower, who will work in our field?"
- Spontaneous clusters too have benefitted from government action
  - Geographic Indication (GI) for eggplant that brought the variety attention
  - Lift irrigation schemes
- Organized clusters
  - Leverages midstream (traders/input dealers, etc.)
  - Sustainability questions (Farmer producer companies – FPCs that have been formed)

Market transformation, 2015-2025

Markers of growing commercialization

- Proliferation of markets (disproportionately, private markets)
- Perennialization of markets: increase in share of daily markets, work more days/week and hours/day, increase in share of permanent stalls
- Size of market: Wholesalers and retailers have increased in number (60 and 20%) as has quantity traded (74%).
- Deliveries on foot and bicycle have given way to motorized transportation, esp. large 20-ton trucks that cover longer distances

Deconcentration of markets:

- ~87% of markets have grown
- Hirschman Herfindahl index of concentration is 1/3rd and 2/5^{ths} of volumes traded and delivered in 2015, respectively.

Densification of ancillary services:

- Have grown more than proportionately to markets.

Vegetable market transformation

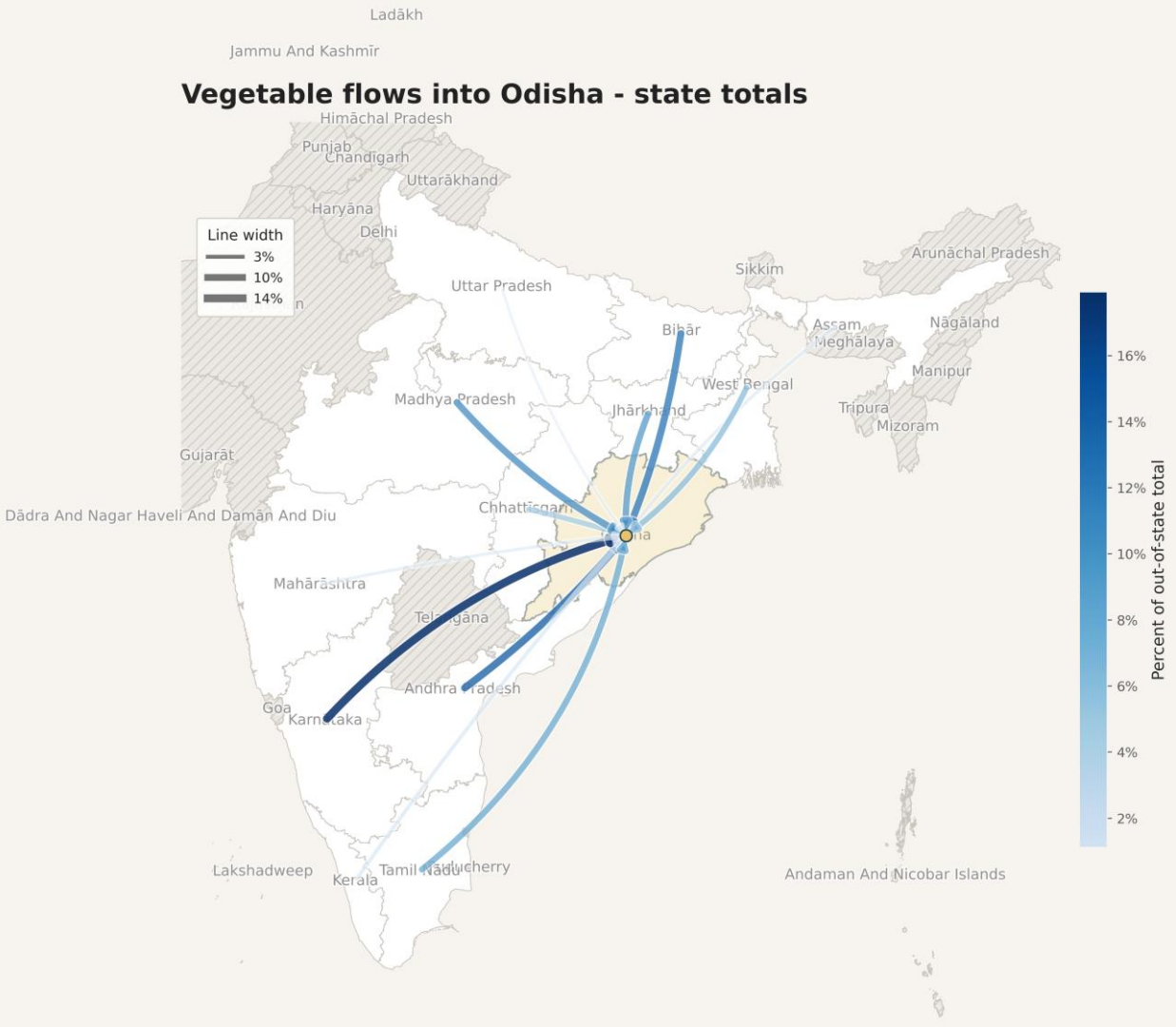
Working with: MICHIGAN STATE UNIVERSITY · EGERTON UNIVERSITY · IFPRI INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

Type	Total (2015)	% of villages (2015)	Total (2025)	% of villages (2025)	Decadal growth (%)
Village traders: sell to outside traders	137	25	288*	38	**110**
Village retailers: sell to local consumers	251	35	436	49	**74**
Outside traders: collect from farmers	142	31	241	48	**70**
Village transporters: sell to outside	21	8	131	38	**524**
Outside transporters: collect from farmers	36	12	135	38	**275**
Vegetable farmers retailing vegetables	2,038	58	3,029	67	**49**

Village level transformation in vegetable marketing (N=154 villages)

Massive interstate vegetable trade via long supply chains

- Production in Odisha mainly for local markets
- Majority of vegetables produced in Odisha sold through local retailers
- Local surpluses sold wholesalers and moved to other districts in Odisha
- Large flows of ‘commodity vegetables’ (e.g. tomatoes) from out of state to make up shortfall in demand



Who is included in the vegetable VC?

Category	Odisha population (%)	Vegetable farmers (%)	Input suppliers (%)	Vegetable wholesalers (%)	Vegetable retailers (%)
Female	49	42	3	1	28
Scheduled tribe	23	24	1	0.5	10
Scheduled caste	17	19	5	4	15
Non-scheduled caste	60	57	94	96	75
N	-	2021	628	384	1,239

- Women and scheduled castes and tribes absent from input supply & wholesaling
- Farming is the most inclusive node of the vegetable value chain
- Retailing is the most inclusive non-farm vegetable value chain node

Women & SC/ST retailers face worse terms of inclusion than men and non-SC

Retailer characteristics	Male retailers	Female retailers
Retailer is female	0	100
No formal education (%)	13	65
Prior occupation was agriculture (%)	38	38
Owns mobile phone (%)	61	21
Value of most recent sale (INR)	138	56
Enterprise startup capital at 2025 prices (INR)	8,354	6,275
Enterprise asset value at 2025 prices (INR)	39,324	19,076
Annual vegetable income (INR)	235,587	145,443
Most recent customer was female (%)	18	35
Expects to expand enterprise in next 5 years (%)	74	87

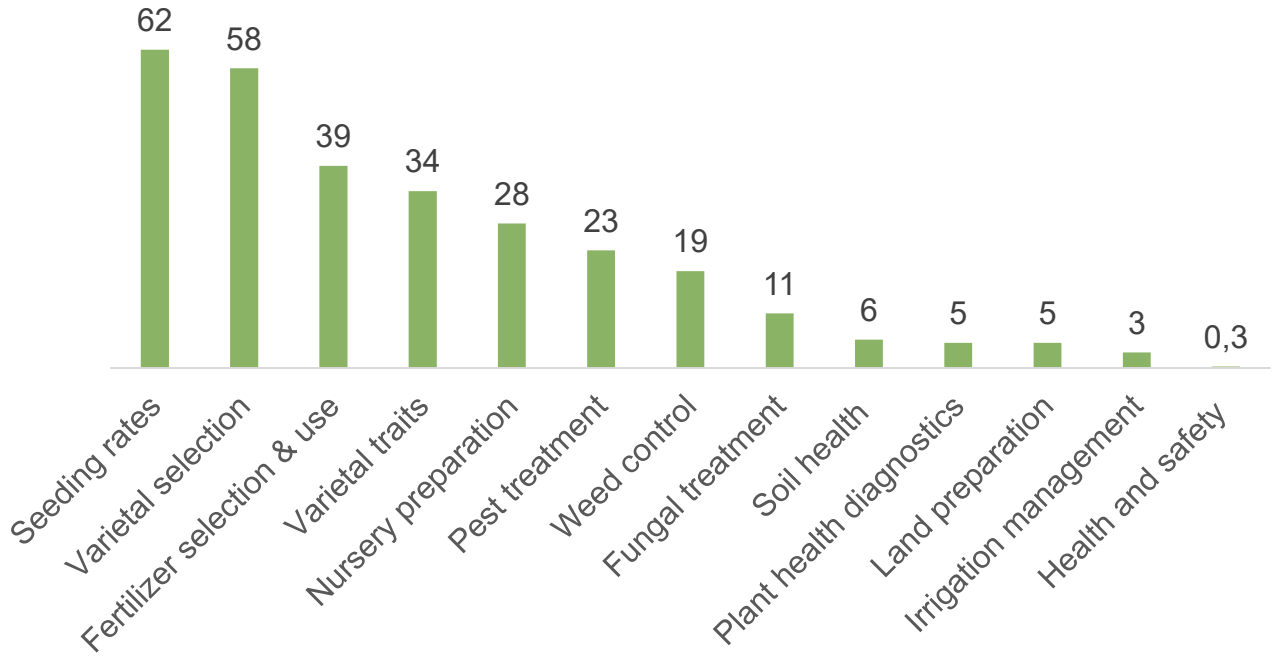
Credit relations between VC actors not exploitative

Working with: MICHIGAN STATE UNIVERSITY · EGERTON UNIVERSITY · IFPRI INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

	Input suppliers	Vegetable farmers	Wholesalers	Retailers
Years traded with most recent customer	4	8	7	5
Buyer advanced money for most recent sale (%)	3	3	7	6
Buyer paid in full at time of most recent sale (%)	94	87	55	92
Buyer will pay for most recent sale with delay (%)	3	5	39	2
Number of days delay in payment (conditional)	33	4	6	5
Gave loan in past year that obligated supplier to sell only to respondent (%)	0.5	n/a	0.5	0.5
Gave loan in past year that obligated buyer to buy only from respondent (%)	0.5	n/a	1.3	1.0
Most recent agricultural loan was from input supplier or vegetable trader (%)	n/a	1.4	n/a	n/a
Took loan in past year to operate or invest vegetable enterprise (%)	14	50	17	11

Services provided to farmers by input suppliers

- 48% of input suppliers were asked for advice during their most recent transaction
- 52% of input suppliers gave advice during their most recent transaction
- Advice was given for free
- Input suppliers are by far the most common source of information on vegetable farming for vegetable farmers



% of input providers giving advice during most recent transaction, by subject (conditional on giving advice)

Services provided by VC actors

- Half of wholesalers and retailers collect produce from suppliers
- 1/3 of transport provided by wholesalers and 1/4 by retailers provided by 3PLS (transport rental enterprises)
- Limited product upgrading/value addition activities by wholesalers & retailers (80% did nothing)
- Few services offered by input suppliers, other than information
- Transitional stage of value chain development
- But: 2/3 of farmers sort & grade product, capturing value for themselves

Recommendations

Working with: MICHIGAN STATE UNIVERSITY · EGERTON UNIVERSITY · IFPRI INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

Technology

- Seeds : Climate resilient vegetable seeds
- Seeds: Improved varieties of "niche" crops
- Biodegradable materials (mulching; seed trays, packaging)
- Nursery and polyhouse technology, design and dissemination
- Digital technologies for precision agriculture (drones, irrigation, IoT)

Policy

- Market infrastructure (improvements /user-centric design)
- Market governance reform
- Infrastructure for sustainable irrigation (Rehabilitation repairs and maintenance for govt. infrastructure; financing for private irrigation)
- Social protection for retailers/ targetting transfers to nano enterprise development

Institutions

- Accelerator programs to strengthen MSME and small farmer collective, esp. in clusters (in organized APCs)

INCATA: Linked Farms and Enterprises for Inclusive Agricultural Transformation in Africa and Asia

INCATA Project: Preliminary results

November 4, 2025

RIMISP
Centro Latinoamericano para el Desarrollo Rural