2nd Annual Agriculture, Nutrition & Health (ANH) Academy Week and
5th Annual Feed the Future Innovation Lab for Nutrition Agriculture-Nutrition Scientific Symposium

Efficiency of Small Scale Vegetable Farms: Policy Implications for Rural Poverty Reduction and Nutrition Security in Nepal

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Introduction

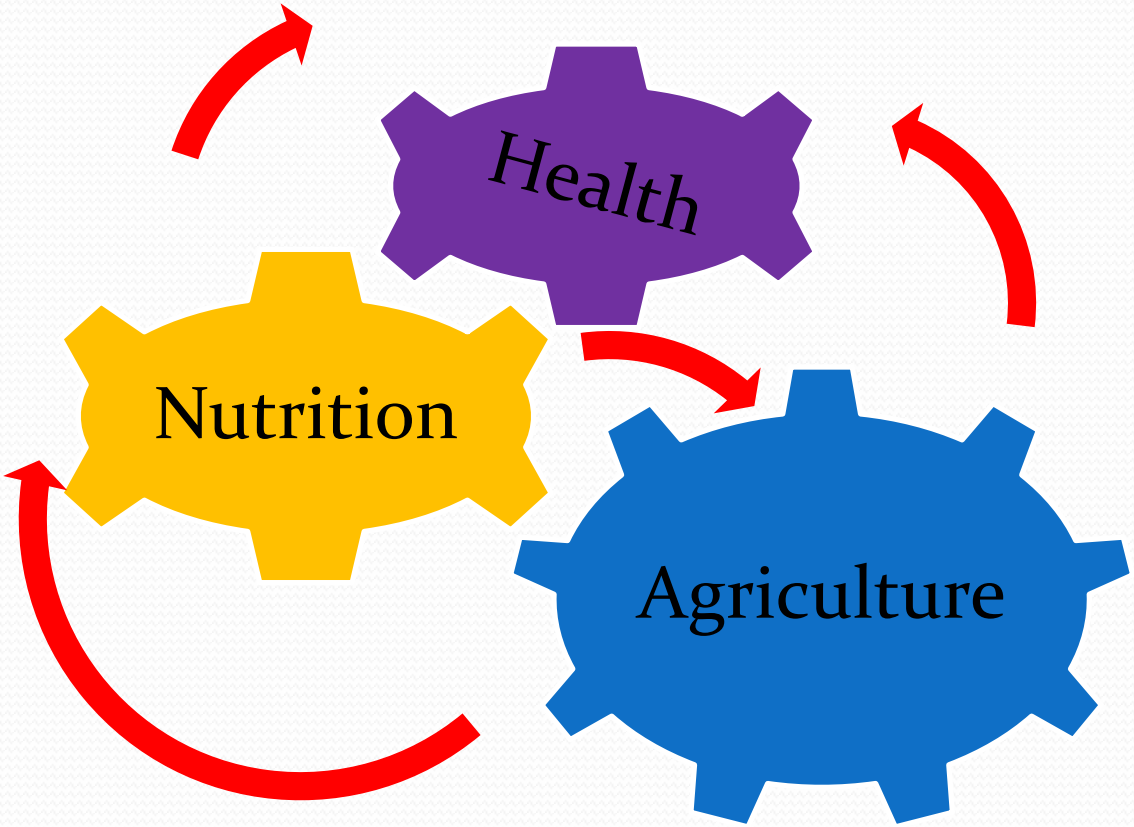


Fig.1. Agriculture, nutrition and health relation

Conceptual Framework- Nutrition

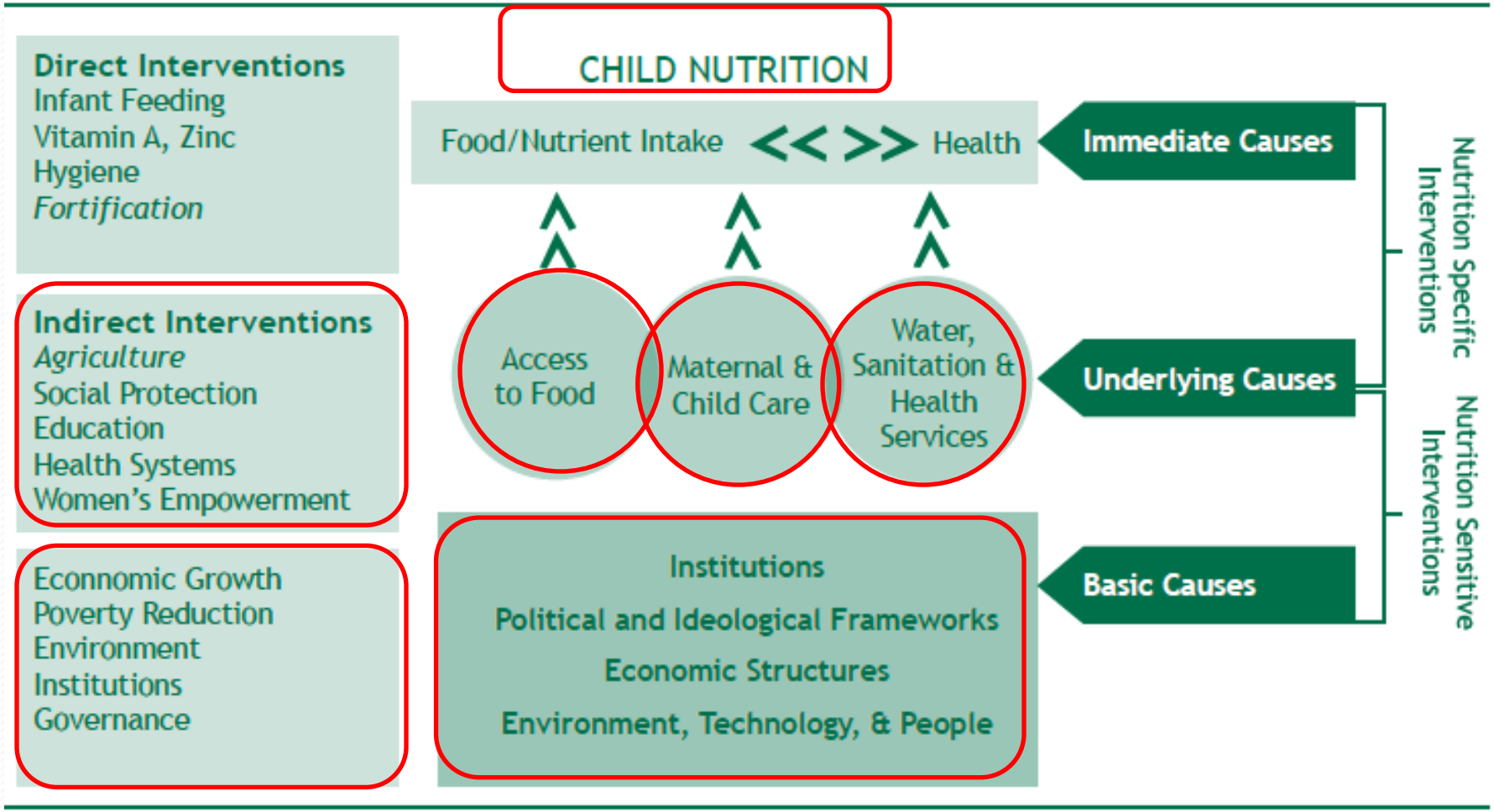


Fig.2. Conceptual Framework of Child Nutrition (Source: UNICEF, 1990)

Framework for Malnutrition:
Food Insecurity and Vulnerability Mapping System

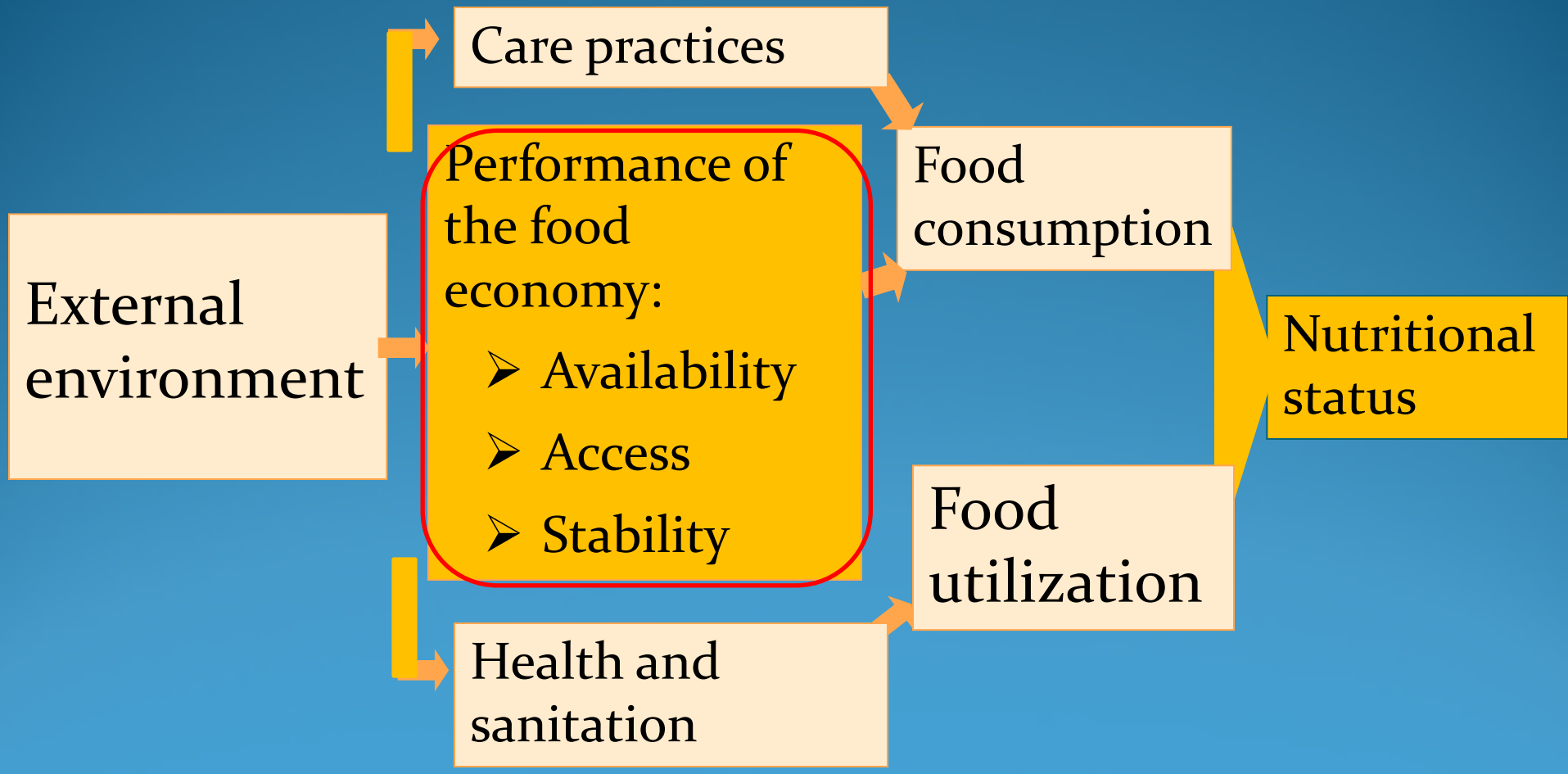
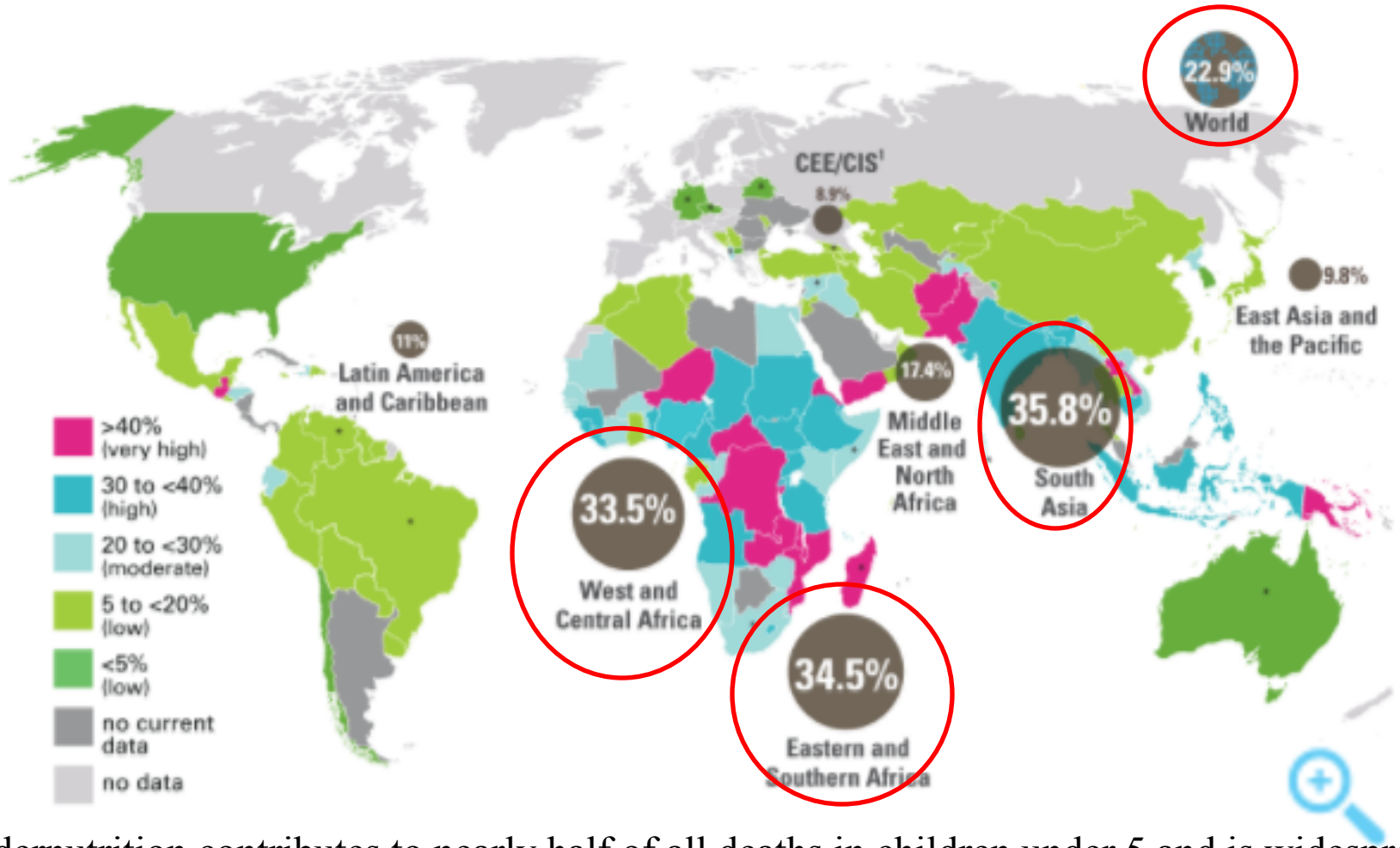


Fig.3. Conceptual Framework of FIVMS (Source: UNICEF, 1990)

Global Overview-Malnutrition



Undernutrition contributes to nearly half of all deaths in children under 5 and is widespread in Asia and Africa

Fig.4. Food and Nutrition Security (Source: FAO, 2016)

Global Hunger Index in Nepal

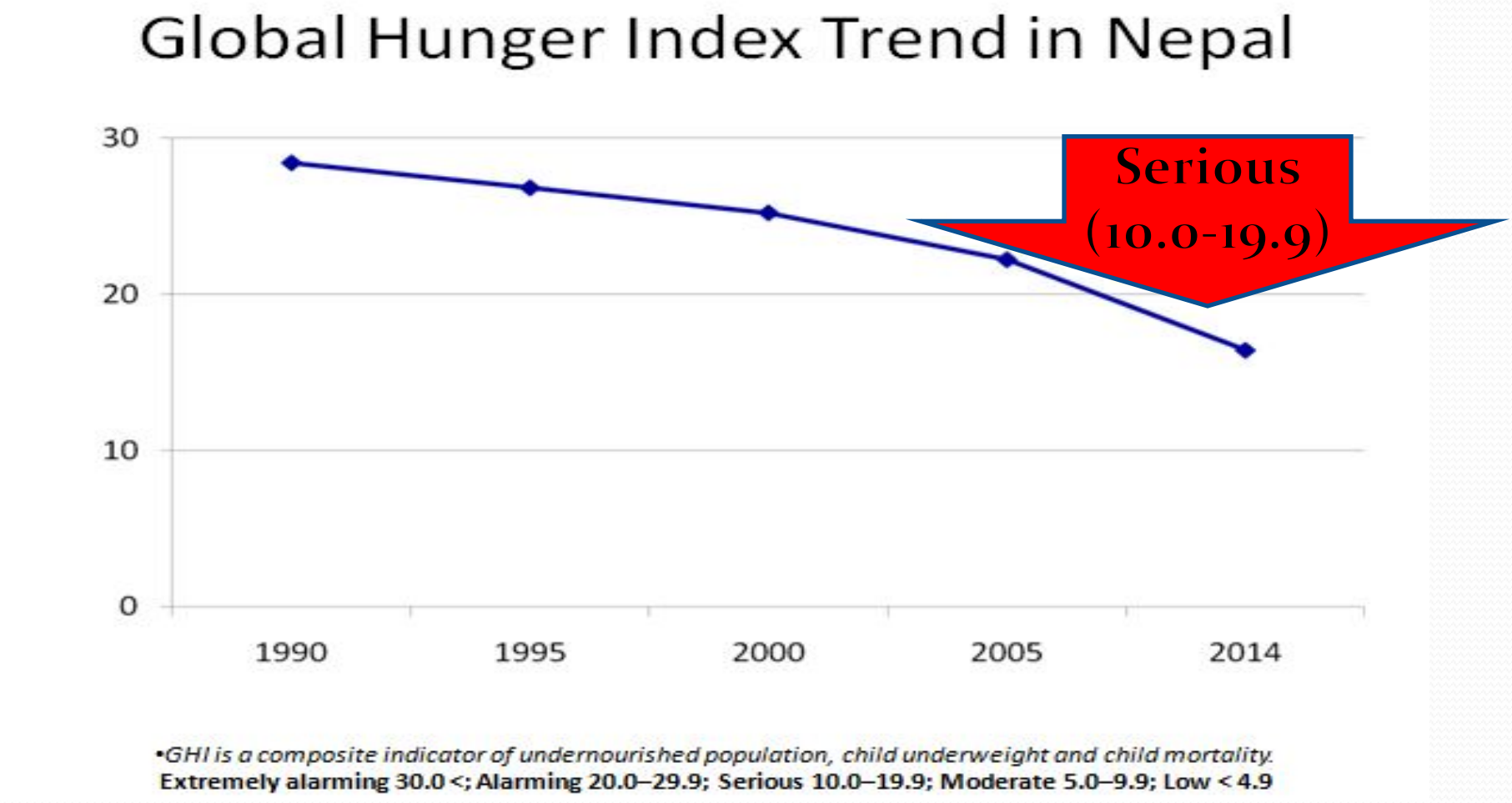


Fig.6. Global Hunger Index (NPC, 2017)

Child Undernutrition Trend in Nepal

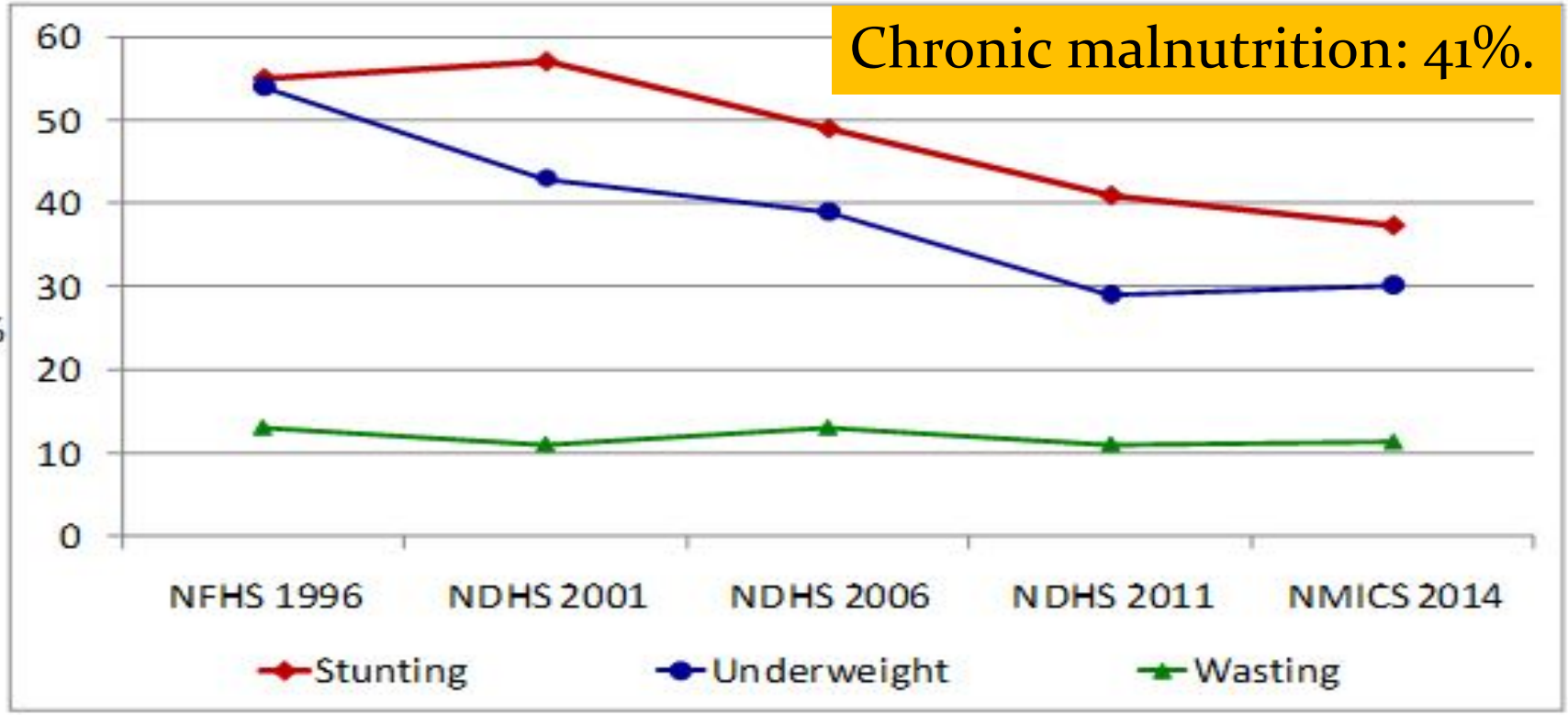


Figure 7. Child Undernutrition (Source: NPC, 2016)

Challenges- SDGs-ANH

SDG 1:
No poverty- all forms, everywhere by 2030;

SDG 2:
Zero hunger- achieve food security, improved nutrition, and promote sustainable agriculture.

Major Challenges in ANH

- **Access to adequate and quality foods**
  - Optimizing/efficiency of agriculture- inputs, outputs, and post-harvest;
  - Increase productivity, commercialization and competitiveness;
  - Enhance the economics of scale - smallholders;
  - Resilience to climate change
- Reduce poverty (21.6%)-third highest in SAARC);

Major Challenges in ANH

- Behavioral change-maternal and child care and feeding practices;
- Water, sanitation and health services;
- Sustainability of the development goals;
- Zero- stunted, wasted, and underweight children

Policy Framework

I. Agriculture Development Strategy (ADS), 2014;
II. Zero Hunger Challenge National Action Plan, 2016 (2016 - 2025);
III. Food and Nutrition Security Plan of Action (FNSPA) of Nepal, 2014;
IV. Multi-Sector Nutritional Plan, 2012;
V. National Nutritional Policy and Strategy, 2008;
VI. National Agriculture Policy-2004;
VII. Sector Policies (tea, coffee, fertilizer, irrigation…, etc.)

National Goal and Strategy

Goal 1: Poverty alleviation

Goal 2: Food and Nutrition Security

Best Strategic Option:
Optimization and efficiency in agriculture
- Resource use
- Production
- Marketing

Vegetable Sector should be the Priority Sector

Research Results

Efficiency of small scale vegetable farms: policy implications for the rural poverty reduction in Nepal

Available at:
Agricultural Economics
http://www.agriculturejournals.cz/web/agricecon/articles/81_2015-AGRICECON/

Study Site

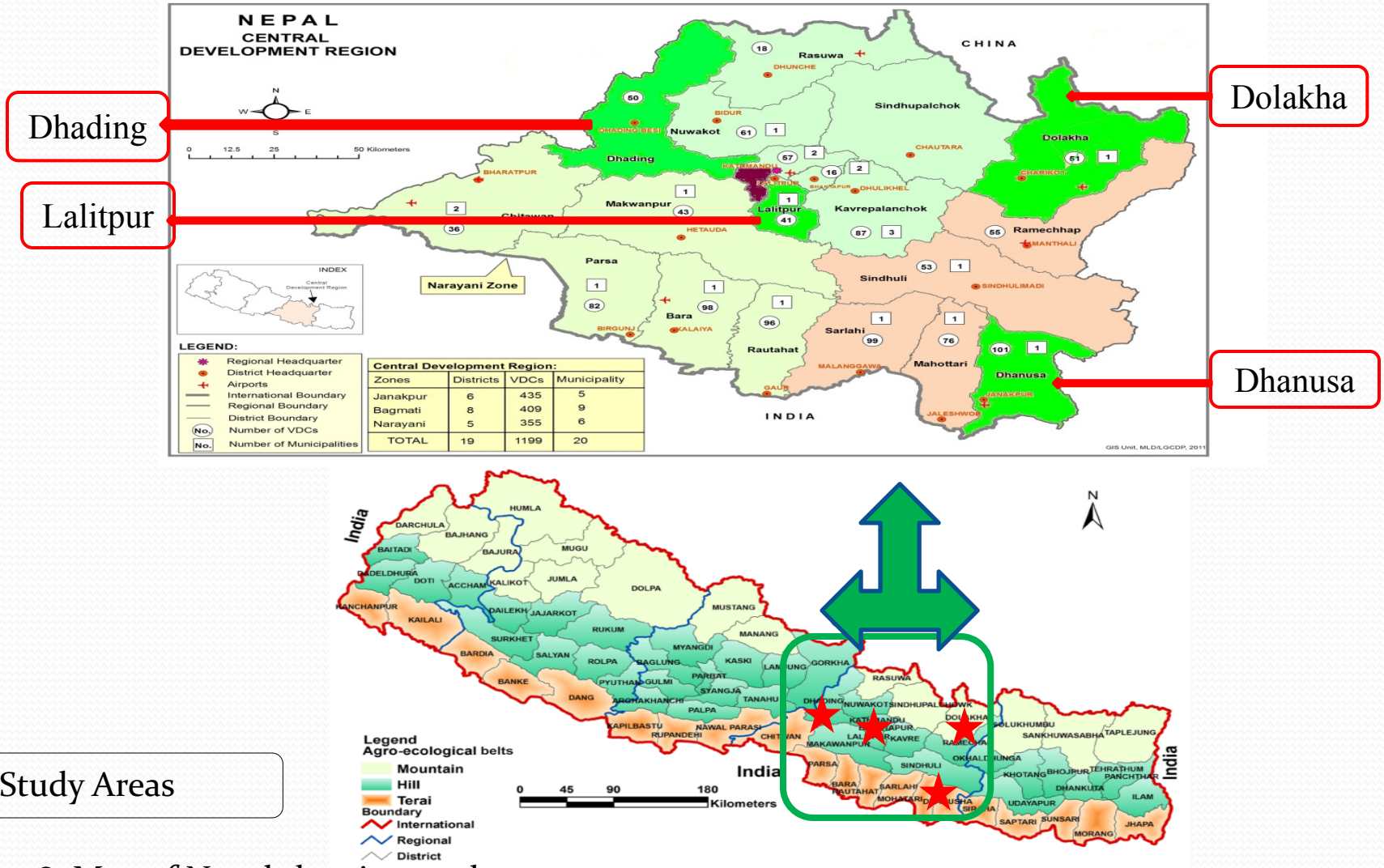


Figure 8. Map of Nepal showing study areas

Materials and Methods

Analytical framework

Input oriented DEA model (Charnes et al., 1978)

$$\min \theta^{CRS}$$
$$\theta_i^{CRS}\ \lambda$$
$$\text{Subject to: } Y_i \leq Y\lambda$$
$$\theta_i^{CRS} X_i \geq X\lambda$$
$$\lambda \geq 0$$

Cost-minimizing DEA model (Fare et al., 1985, 1994)

$$\min W_i' X_i^*$$
$$x_i^* \lambda$$
$$\text{Subject to: } Y_i \leq Y\lambda$$
$$X_i^* \geq X\lambda$$
$$\lambda \geq 0$$

Materials and Methods

Tobit analysis

$$EE_i^* = \beta_0 + \sum_{m=1}^{M} \beta_m W_{im} + \varepsilon_i, \qquad \varepsilon_i \sim ind(0, \sigma^2)$$

$$EE_i = 1 \; if \; EE_i^* \geq 1$$

$$EE_i = y_i^* \; if \; 0 \leq EE_i^* \leq 1$$

$$EE_i = 0 \; if \; EE_i^* \leq 0$$

EE_i^* is latent variable represent efficiency index

Efficiency Scores: CRS

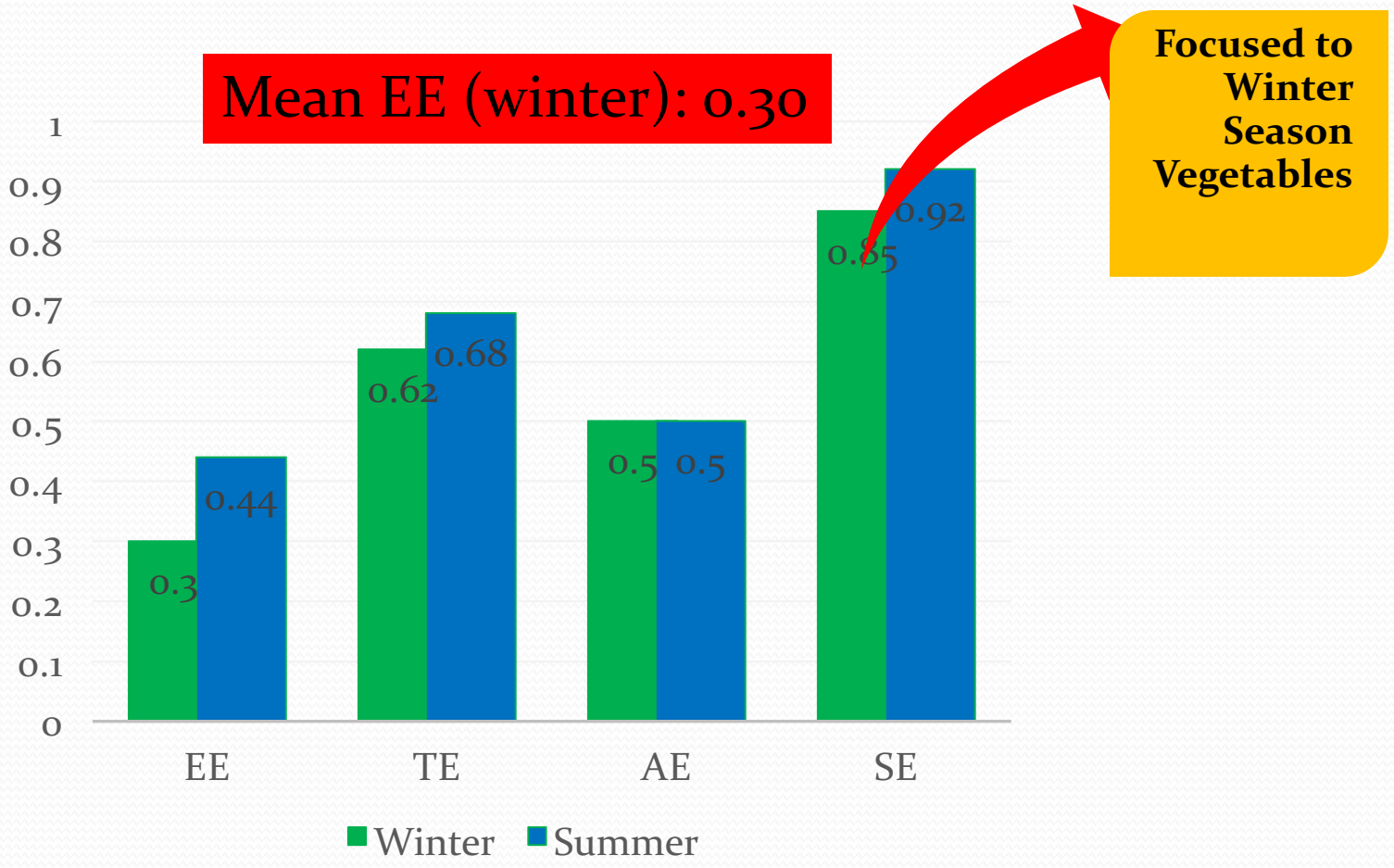


Figure 9. Farm efficiency scores in winter season

Results

Table 1. OLS estimates and standardized coefficients in vegetable farms

Variables	Ordinary least square		Std. coefficient	
	Coefficient	Std. error	Beta value	Rank
lnLabor	0.286[a]	0.067	0.243	1
lnChemical fertilizer	0.200 [a]	0.030	0.239	2
lnOrganic matter	0.257[a]	0.042	0.214	3
lnLand	0.159[a]	0.060	0.153	4
lnTraction power	0.104[b]	0.045	0.091	5
lnSeed	0.059[b]	0.033	0.056	6
lnOther input cost	-0.016	0.038	-0.012	7
Sum of elasticity	1.049			

Superscripts [a], [b], [c] indicate significant at 1, 5 and 10 % levels, respectively

Results

Table 2. Factors affecting EE, AE, and SE (winter season)

Explanatory variables	EE		AE		SE	
1. External support index (fertilizer, irrigation, seed, pesticide, production materials, extension service, post-harvest materials)	0.010 (0.005)	b	-0.003 (0.005)		-0.016 (0.007)	b
2. Women participation index (land preparation, plantation, crop management, harvesting-marketing, decision making)	0.002 (0.002)	c	-0.002 (0.002)		-0.001 (0.002)	
3. Credit access	0.020 (0.013)	c	0.044 (0.015)	a	-0.033 (0.017)	b
4. Market access	0.021 (0.016)	c	0.029 (0.018)	c	-0.014 (0.022)	
5. Improved seed type	0.021 (0.015)	c	0.046 (0.017)	a	-0.008 (0.020)	

Superscripts [a], [b], [c] indicate significant at 1, 5 and 10 % levels, respectively

Results

Table 3. EE, actual cost, min. cost, and potential cost reduction (Ha)

Variables	Mean EE	Actual Cost (Rs./ha)	Min. Cost (Rs./ha)	Potential Cost Reduction (%)
Cost minimization by farm size (small farm-Efficient)	0.28[a]	40030[a]	9188[a]	74.38[a]
,, seed types (improved seed-efficient)	0.31[b]	35842[c]	9063	74.70[c]
,, trainings	0.30	37866[a]	9169.5[a]	75.95[a]
,, credit access	0.30	37203[c]	9158.5[a]	75.37[c]

Results

Table 3. EE, actual cost, min. cost, and potential cost reduction (Ha)

Variables	Mean EE	Actual Cost (Rs./ha)	Min. Cost (Rs./ha)	Potential Cost Reduction (%)
Cost minimization by market access	0.31[b]	34822.5[a]	8972.5	74.03[a]
,, external support	0.30[c]	36745[a]	9054.5[b]	75.205[a]
,, gender of farm manager	0.32[a]	33933.89[a]	8902[c]	73.43[a]
,, women participation index	0.30[b]	36427.5[a]	9043	75.09[a]
Mean EE	0.30 (0.39)			75%

Conclusions

1. Mean EE: 0.30;
   - A wide range and great extents of inefficiencies

2. Potential cost reduction: 75 %;

3. Important input variables (based on standardized coefficient):
   - Labor, organic matter, improved seeds.

Conclusions

4. External factors affecting inefficiency (decreasing order):
   - ✓ Credit access;
   - ✓ Market access;
   - ✓ External support index;
   - ✓ Women participation index.

5. Optimization in production and cost reduction– contribute to poverty reduction;

6. Consumption of diverse vegetables - contribute to improve nutrition security.

Policy Implications

1. Increase labor productivity and encourage organic matter.

2. Promote research and development:
   - Demand based, stress tolerances, and disease pest susceptible.

3. Empower and encourage women farmers

4. Market access

5. Credit access.

Research Gap

Smallholder Farm Efficiency, Food Supply and Consumption, Nutrition Security and Health Gain in Earthquake Prone Areas of Nepal

- Assess the relationship of farm efficiency- food supply and consumption- nutrition security-health gain;
- Determine the factors influencing food production and consumption, and nutrition security;
- Suggest policies to enhance the food production and improve the nutrition security.

Research Gap

Methodology:

Data: - DHS-1996, DHS-2011, DHS-2015;

- Cross-sectional data

Analytical tools: Econometric (will develop model);

Variables:

Agriculture and non-agriculture economic activities, labor migration, education (women), gender role and women empowerment, household income, health and sanitation, clean drinking water, environmental, social protection, and other socio-economic variables, etc.

THANK YOU
FOR YOUR ATTENTION!!!