

# Impact of a pilot school garden project on children's food knowledge, preference and behavior in Nepal



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Nepal



**NARC**  
Nepal Agricultural Research Council



**WorldVeg**

# Background

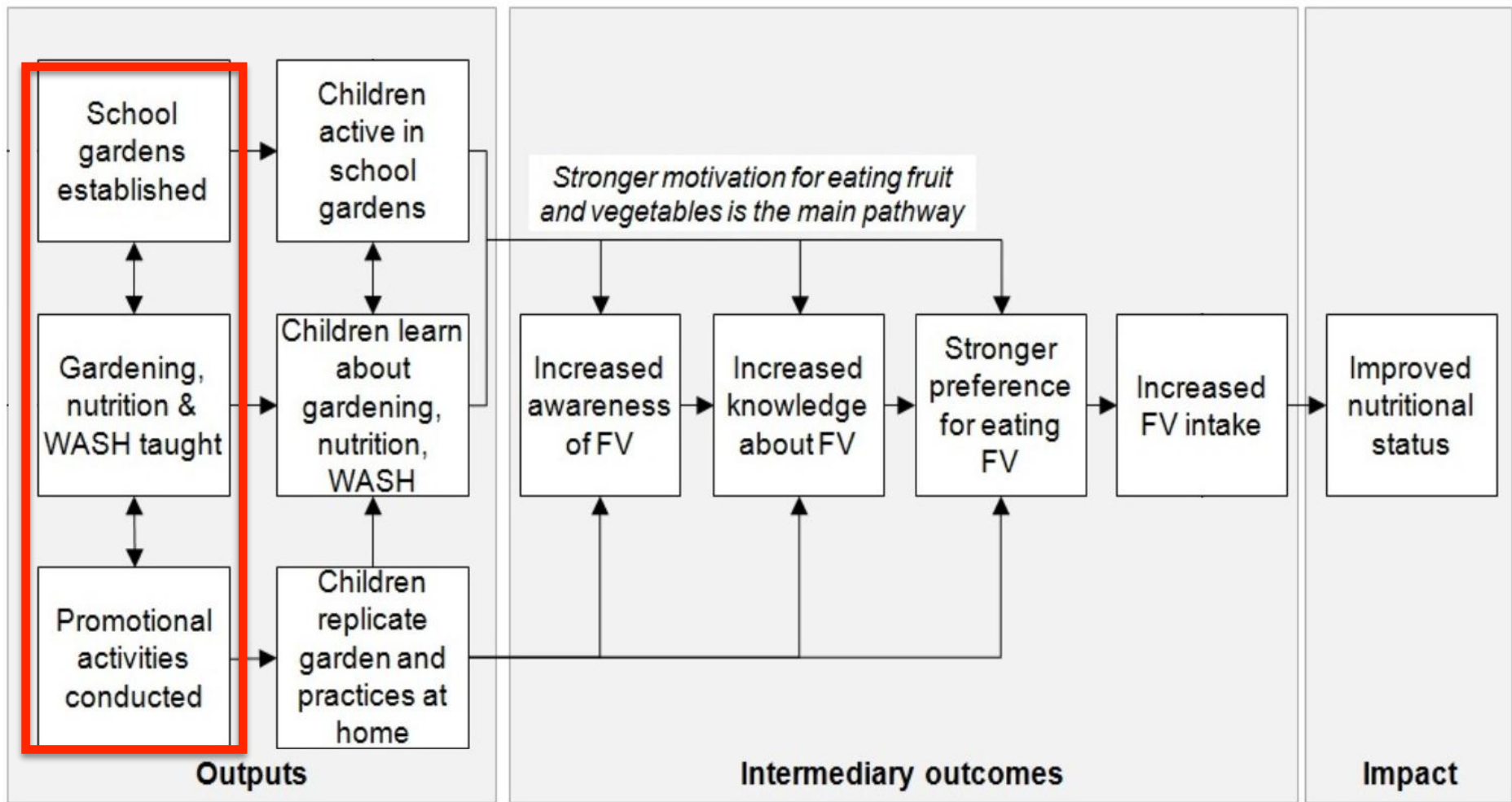
- Malnutrition is a serious problem in Nepal
- Poor nutritional status of Nepalese population, particularly in rural communities; 39% of children under 5 is underweight and 49% is stunted (UNICEF 2012)
- Low consumption of fresh fruit and vegetables are key problems
- So, this research was conducted in Nepal to identify the effect of school gardening on knowledge, preference and consumption of fruits & vegetables

# Research questions

Do school gardens linked to complementary lessons and promotion:

- ❑ Raise children's awareness about healthier foods; increase their knowledge about sustainable agriculture, nutrition, and WASH; and strengthen their preferences for eating healthier foods?
- ❑ Improve the dietary behavior and nutritional status of 10- to 15-year-old school children in Nepal?

# Impact pathway of the intervention

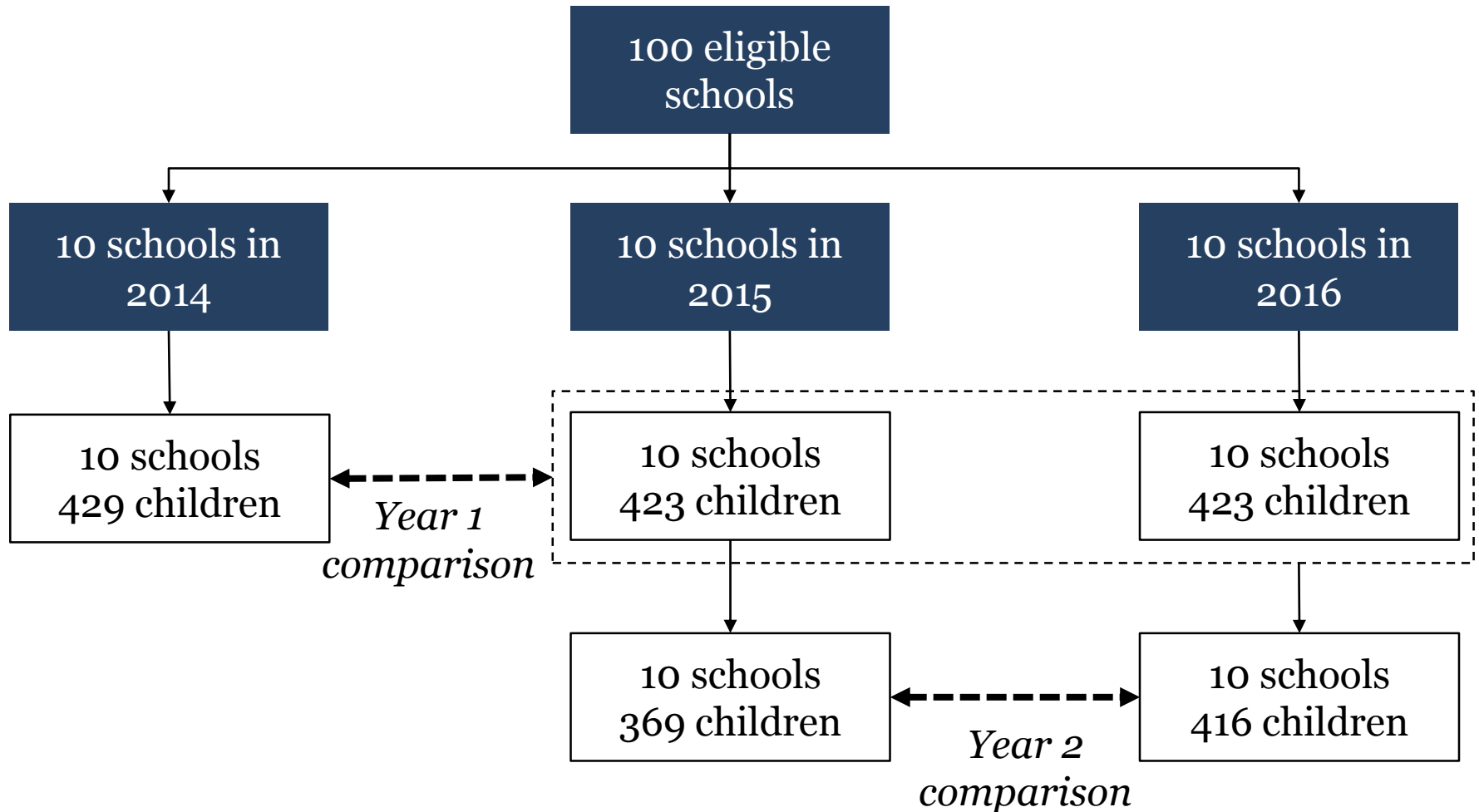


FV: Fruits and vegetables

# Methods

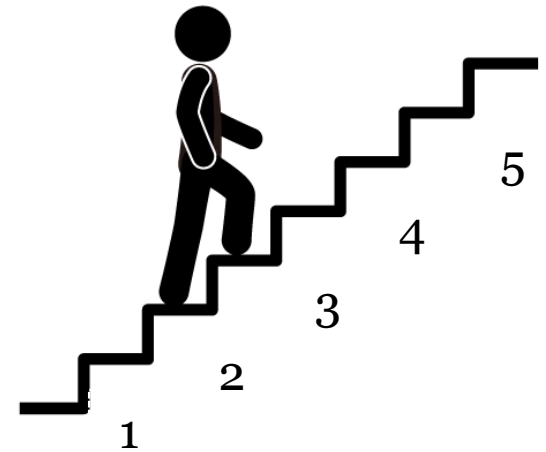
- Designed a school garden program for Nepal as a joint project of NARC, Ministry of Education, and Ministry of Health and Population with technical support of the World Vegetable Center
- Tested the intervention using a repeated cluster randomized controlled trial design
- Random selection of 10 treatment and 10 control schools per year and a random sample of about 40 children per school (grades 6 and 7)
- Impact quantified using a difference-in-difference method

# Cluster randomized controlled trial



# Outcome indicators measured

1. Do school children become more aware of fruits and vegetables?
2. Do they gain more knowledge about sustainable agriculture and nutrition/WASH?
3. Do they develop healthier eating preferences?
4. Do they eat more fruit & vegetables?
5. Does their nutritional status improve?























# Examples of tools used

Day 2

4

What are the names of these?  
(Leave blank if you can't tell or don't remember)

	1 .....		11 .....
	2 .....		12 .....
	3 .....		13 .....
	4 .....		14 .....
	5 .....		15 .....
	6 .....		16 .....
	7 .....		17 .....
	8 .....		18 .....
	9 .....		19 .....
	10 .....		20 .....

Day 3

6













Do you agree with the following sentences?  
(Cross only one per row ☒)

Statement	AGREE	DON'T AGREE
1. Eating meat helps to build muscles.	<input type="checkbox"/>	<input type="checkbox"/>
2. Drinking milk gives you strong teeth.	<input type="checkbox"/>	<input type="checkbox"/>
3. Rice contains more vitamins than fruits.	<input type="checkbox"/>	<input type="checkbox"/>
4. Bread is a good source of proteins.	<input type="checkbox"/>	<input type="checkbox"/>
5. Eating lemons and oranges helps to protect against disease.	<input type="checkbox"/>	<input type="checkbox"/>
6. Eating dark green leafy vegetables is more healthy than light-green ones.	<input type="checkbox"/>	<input type="checkbox"/>
7. Vegetables help to protect against infections.	<input type="checkbox"/>	<input type="checkbox"/>
8. You should not drink more than six glasses of water a day.	<input type="checkbox"/>	<input type="checkbox"/>
9. Breakfast is the most important meal of the day.	<input type="checkbox"/>	<input type="checkbox"/>
10. Vegetables that taste bitter are dangerous to eat	<input type="checkbox"/>	<input type="checkbox"/>

Day 5

9

Which of these vegetables and fruits do you like to eat? (Cross only one per row ☒)

	I don't know it	I do not like to eat it	I like to eat it	I like to eat it a lot
 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
 5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
 6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
 7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
 8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
 9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
 10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
 11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
 12	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# Dolakha & Ramechhap districts



I.

Some highlights of  
the school garden  
intervention

# 1. Planning phase

1. One-day Inception Workshop on Vegetable Go to School project was held on 31 March, 2014 at Khumaltar
2. "Curriculum and Student Action Plan" was prepared in Nepali and published
3. Orientation was given to the teachers on how to implement garden activities and the 23 week action plan.



# Crop calendar

Plot no.	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	May
1	-	Radish ( <i>40 days</i> )		Fenugreek ( <i>Local Variety</i> )		Brinjal ( <i>Pusa Purple Long</i> )			
2	-	Broad Leaf Mustard ( <i>Kumal Red</i> )				Tomato ( <i>Sirjana</i> )			
3	-	Spinach ( <i>Local Variety</i> )				Pumpkin/Squash ( <i>Local Variety</i> )			
4	-	Cauliflower ( <i>Kumal Jyapu</i> )				Yard Long Bean ( <i>Kumal Thane</i> )			
5	-	Turnip ( <i>Kathmandu Red</i> )				Capsicum ( <i>California Wonder</i> )			
6	-	Fenugreek ( <i>Local Variety</i> )		Coriander ( <i>Local Variety</i> )		Swiss Chard ( <i>Susag</i> )			
7	-	Broccoli ( <i>Green Sprout</i> )				Okra ( <i>Parbhani Kranti</i> )			
8	-	Carrot ( <i>Nantes</i> )				Vegetable Soybean ( <i>Local Variety</i> )			
9	-	Garden Peas ( <i>Arkale</i> )				Bitter gourd ( <i>Green Karela</i> )			
10	<b>POLYHOUSE (NURSERY)</b>								

## 2. Implementation phase

1. Support given to set up the school garden
2. Activities implemented according to the action plan
3. Book and seeds and money for basic inputs provided
4. Regular follow-up conducted



# Garden implementation

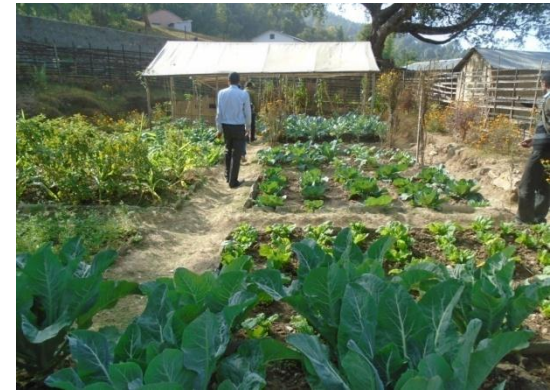
Before



During



After



# Garden implementation

Before



During



After





 **Happy organic gardening**





### 3. Promotional activities

- Parents/community invited
- Harvesting event
- Harvested vegetables distributed for home consumption (no school meal program)
- Promotional activities (e.g. pencil bags, posters, competitions)
- Study tour for the focal/head teachers (12-16 March, 2016)
- Certificated & prizes



II.

Results of the  
impact evaluation

# School garden production

Average vegetable production per school per year (85 m<sup>2</sup> land- planting beds), 2014-15.

<b>Bed</b>	<b>Winter season</b>	<b>kg</b>	<b>Summer season</b>	<b>kg</b>
1	Radish	7.8	Brinjal	7.1
2	Broad leaf mustard	4.2	Tomato	19.6
3	Spinach	2.5	Squash	20.5
4	Cauliflower	9.6	Yard long bean	6.7
5	Turnip	6.5	Capsicum	10.2
6	Broccoli	5.8	Swiss chard	2.5
7	Carrot	4.0	Okra	15.2
8	Fenugreek	1.5	Vegetable soybean	5.0
9	Peas	5.2	Bitter gourd	12.8
<b>Total</b>		<b>47.1</b>		<b>99.6</b>

# Sample characteristics

Characteristic	Control (n=416)	Treat. (n=369)	Sign.
Age (years)	12.5	12.6	
Female (%)	59.4	53.9	
Parents are farmers (%)	83.2	87.8	
Stunted (%)	41.4	47.4	*
Wasted (%)	9.9	8.7	

Significance levels: \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \*  $p < 0.10$ .

Note: year 2 comparison only.

# Evidence for impact

Outcome indicator	Year 1 (n=2,550)		Year 2 (n=1,570)	
	Impact	Sign.	Impact	Sign.
Awareness (%)	29.4	***	12.8	***
Agricultural knowledge (%)	21.7	***	16.7	***
Nutrition/WASH know. (%)	13.8	***	14.6	***
Preferences (%)	15.8	***	19.1	***
Vegetable consumption (%)	2.35		0.91	
Fruit consumption (%)	-0.75		7.11	

# Cost of establishing the garden

Item	Description	NRs	USD
Labor	Land preparation	10,000	100
	Fencing	7,500	75
	Polyhouse construction	1,500	15
	Skilled labor	5,000	50
	Preparation of garden plots	6,000	60
Bamboo/plastic	Fencing	4,500	45
	Polyhouse construction	3,000	30
	Plastic for tunnel (85 gauge)	6,000	60
			100
Equipment	Kodalo, Kuto, watering can, khukuri, etc.	10,000	
	Water tank	10,000	100
	Pipe	12,000	120
Inputs	Manure (FYM)	7,500	75
	Seed	7,000	70
Maintenance		5,000	50
<b>Total</b>		<b>9,5000</b>	<b>950</b>

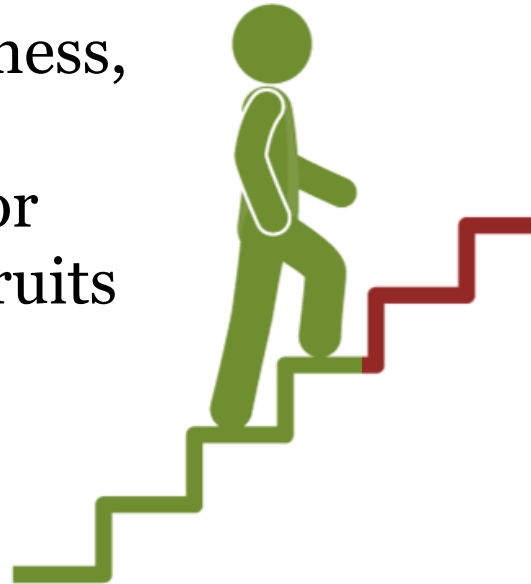
III.

Conclusion

# Conclusion

## **Achieved:**

Improved awareness,  
knowledge,  
preferences for  
vegetables and fruits



## **Not yet achieved:**

Increased  
consumption of fruit  
and vegetables



# Conclusion

- Project was exemplary in its collaboration between ministries (agriculture, health, education).
- The usefulness of this collaboration was recognized by all 3 ministries and recognized by policy makers.

# Conclusion

- More emphasis may be needed to:
  - (A) **raise parents' awareness and knowledge** about the importance of eating fruit and vegetables and nutrition/WASH practices for health.
  - (B) **increase household availability of fruit and vegetables**, for instance, through home gardens.
- Results point at the **importance of integrated approaches** combining agriculture, nutrition and health.

# Scaling efforts

- Policy workshop
- Media coverage (TV, documentary)
- Manuals
- Scientific publications



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<http://dx.doi.org/10.1080/19439142.2017.1311356>

ARTICLE

**Impact of school gardens in Nepal: a cluster randomised controlled trial**

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**ABSTRACT**  
 This study evaluates the combined impact of school gardens linked to complementary lessons and promotional activities about gardening and nutrition on the nutritional awareness, knowledge, perceptions, eating

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Research Paper

**Effect of school vegetable gardening on knowledge, preference and consumption of vegetables in Nepal**

Dhruba Raj Bhattarai<sup>1</sup>, Giri Dhan Subedi<sup>2</sup>, Tej Prasad Acharya<sup>3</sup>, Pepijn Schreinemachers<sup>4</sup>, Ray-yu Yang<sup>4</sup>, Greg Luther<sup>4</sup>, Upendra Dhungana<sup>4</sup>, Krishna P. Pradhan<sup>4</sup> and Narayan Kaji Kashichhawa<sup>4</sup>

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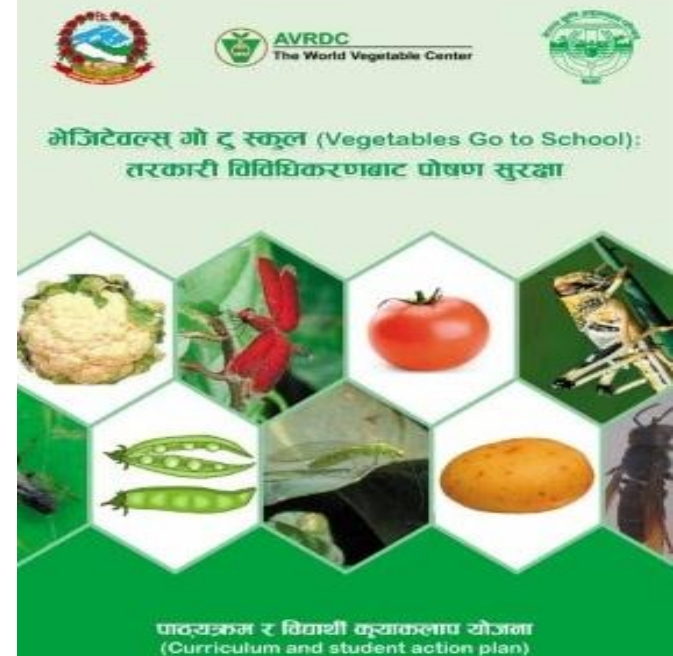
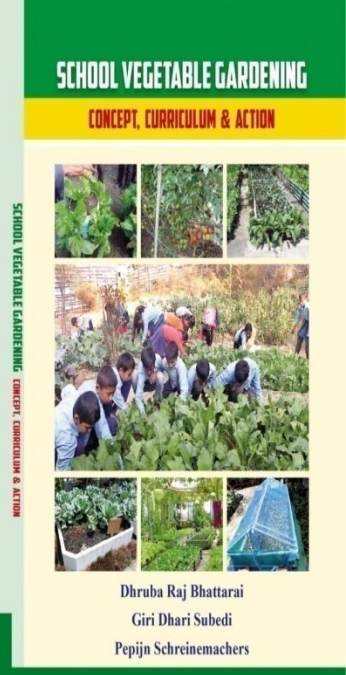
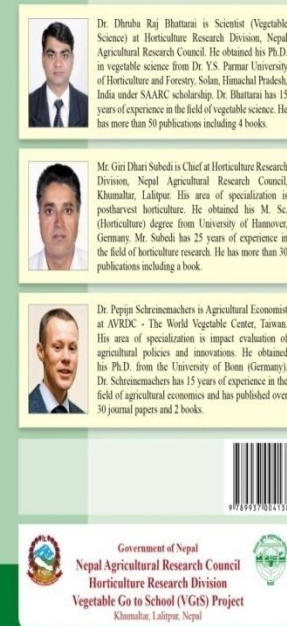
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...to improve knowledge from hills (Dohb) areas by using a randomisation activities. The results of 6 and 7. Post-intervention the consumption of vegetables increased their level of knowledge realized by major areas of the community (NARC) maximum. As leads to physical in people of all

...been recognized the willingness use this concept has for nutritional education

# Publications

- A book entitled “School vegetable gardening: concept, curriculum and action” has been published
- Research paper has been published in International Journal of Horticulture, 2015, Vol.5, No.20
- A curriculum book in Nepali language published
- Two articles related to school vegetable gardening was published in national news paper **Kantipur Daily**
- A research paper titled “Impact of school garden in Nepal” has been published in Journal of Development Effectiveness



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