

The Other Side of the World: Experiencing India through Friendship, Traffic, and Vegetables



Claire Runquist
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AVRDC-RCSA
The World Vegetable Center, Regional Center for South Asia

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II. INTRODUCTION

The traffic in India doesn't even compare to the most congested freeway or intermittent road rage back home in America. Three lanes become five and a half, and cars scrape each other more often than they should. Almost every car has at least some sort of battle wound from meeting another car at the wrong time on the insane roads. The potholes and bumps must wear away at the suspension of the car, but car repair seems far from a top priority here. Traffic here is sort of an every man for himself mentality (and it is mostly men driving). Autorickshaws crowd around you like tiny metallic bugs, trying to get a few more Rupees, hoping you will pick them to drive you to your (final?) destination.

I think the traffic here is much more representative of the world than the orderly traffic seen at home. The world is not straightforward with everyone signaling their every move and using the horn only for emergencies. The world is chaotic with so many layers that can move and change and challenge our minds. The mindless straight ahead driving in America is like ignorance of the world.

Before I left on this whirlwind adventure, I hadn't even considered a commonplace thing like traffic. Even the very night I arrived in Hyderabad, I realized that so many of the things that I took for granted would be thrown out the window and so many new layers would be added to my narrow world. Even in the middle of the night, the driver drove in the middle of lanes, and honked at every truck we came to. The stoplights were ignored and other traffic signs weren't even present.

Being thrown into a completely new world completely changes you, hopefully for the better. Being in India and working at the World Vegetable Center has opened my eyes to the growing complexities of poverty and hunger, making me feel helpless at times. I'm seventeen. What can I possibly do to help over a billion people that aren't even being reached by the most powerful governments in the world?

As I went through the internship my thoughts about this developed and shifted, and I realized that I alone can't solve anything. I can't make the traffic behave. I can't make the cars stay in their lanes or use turn signals. I can't organize the chaos of government policies, economies, gender discrimination or a million other factors that contribute to poverty. But I can learn and try my very best to add something to the cause. Learning. That is exactly what I spent my summer doing. Learning on an entirely different magnitude than my K-12th education was humbling, overwhelming, and inspiring. Now, I need to share my inspiration with others, and hope to help change the world.

III. PERSONAL BACKGROUND

Like it or not, I grew up on a small sustainable farm. The “like it” part included delicious fresh fruit, vegetables, lamb, chicken, turkey, and eggs. It included a beautiful place to roam about, climb trees, and have wild childhood adventures. The “not” part included the dread of chores (which peaked at about 14). A farm like that takes a lot of work, and my parents were never going to let us get away with isolating ourselves from the farm work. That being said, I still had an awareness of the “other” agriculture that surrounded our little island of a farm, and that colored my perceptions of other farmers.

When high school rolled around, I fully grasped the concept of sustainable agriculture, and may have even taken it to a “preachy” level with my classmates at school. I even got to the point of being close-minded about agriculture—automatically condemning anything that wasn't free range or had a drop of pesticides on it.

I have recently realized what a lucky childhood my siblings and I have had. Growing up on that lush farm nourished our bodies and souls in the best way possible. I have learned to be more open minded (especially when thinking on a global level), after a series of events and people in my life. That doesn't mean I embrace traditional agriculture in Iowa, but I do believe in the importance of sustainability and safety for the global food supply.

My high school adventures included two extra-curricular activities that ended up showing me my biggest interests. The first was Envirothon. Envirothon is a national competition that involves forestry, aquatic ecology, wildlife, soils, and a current environmental issue. The second was the National Forensics League (debate), which provided me with quite the education on current events, research, and public speaking. Both of these plus my agricultural interests have led me to my college major plans (Environmental Studies and Political Science/International Relations—it's a work in progress).

IV. WORLD FOOD PRIZE AND YOUTH INSTITUTE INVOLVEMENT

I heard of the World Food Prize as a lowly freshmen. A senior girl name Malory Dreasler that I highly admired was busily working on writing a paper about hunger in Ethiopia. She was my section leader in marching band, and very knowledgeable on the envirothon team. I eventually asked her what she was writing it for, and I was first introduced to the World Food Prize. I'm sure I went home and gushed to my parents about how awesome that would be. I then spent the rest of high school bugging the Extended Learning Program teacher to choose me to go.

Summer 2009, I found out that she had nominated me, and I began feverishly researching and writing. I chose to write about Pakistan (somewhat ironic in hindsight, considering the strained relations between India and Pakistan). I attended the Symposium, and I was so amazed at every single speaker I heard. The most surprising thing to me was the fact that there were so many different perspectives and countries represented. There was disagreement, but no one took anything personally. Everyone was working for the same goal. I came home utterly inspired. Those three days in October had already done wonders to change me. My friends soon got a very thorough (and unasked for) education on the complicated facets hunger

The World Food Prize began to possess my life. I organized a small Hunger Banquet at my church. I convinced my National History Day group to do this year's project on Dr. Norman Borlaug. I wrote my giant term paper in Composition II on world hunger. I stayed home from my family's Thanksgiving trip to write essays for the World Food Prize. I was more anxious to hear back from the World Food Prize than I was to hear if I got accepted into the college of my choice.

When word finally came from the World Food Prize that I was chosen for an interview, I was genuinely surprised, and of course thrilled. The interview occurred on a snowy day. I was most certainly nervous, but also incredibly excited at this opportunity. I loved the nervous chit-chat among the other potential interns. After the interview, I felt good, but realized I had said a few funny things, that may not have been "proper" interview answers (for example, when asked if I was okay with "roughing it" I described my ability to squat in the woods while camping).

It was an anxious wait, but as soon as I found out, I exploded with excitement. It was literally a dream come true. After that came pages of paperwork, countless emails, tons of research and a tummy full of anxious excitement as I waited for June 11th.

V. AVRDC THE WORLD VEGETABLE CENTER-REGIONAL CENTER FOR SOUTH ASIA

The World Vegetable Center has its headquarters in Taiwan. The World Vegetable Center's mission is to alleviate poverty and malnutrition in the developing world through increased production and consumption of safe vegetables. The main focuses of the center are on germplasm, breeding, production, marketing, and nutrition of vegetables.

One of the focuses of the World Vegetable Center is to increase the consumption of indigenous vegetables. These vegetables are native to a place and are therefore well adapted to the conditions, and are a good source of nutrition.

The World Vegetable Center was founded in 1971 as the Asian Vegetable Research and Development Center and has since expanded to Africa as well as other parts of Asia. The Regional Center for South Asia was opened in 2006 and is located in Hyderabad, Andhra Pradesh, India. The center is located on the campus of a larger research institute, ICRISAT (International Crop Research Institute for the Semi-arid Tropics).

The Regional Center for South Asia has more outposts in Punjab and Jharkhand for implementing their home garden projects. Their current research involves home gardens as a way to combat poverty and malnutrition in India. Models of the gardens are raised and the yields as well as pests and solutions are looked at. In addition, a large aspect of the research is preparing recipes for each local area to ensure high consumption of vegetables in a familiar way. AVRDC-RCSA also does breeding and held a learning program entitled “Molecular Marking in Legume and Vegetable Breeding” over the summer.

VI. THE RESEARCH

The summer research I was able to do at AVRDC-RCSA drew from all of the different pools of work that the AVRDC-RCSA office was working on. I was given the opportunity to learn about the whole cycle and every step of the connection between home gardens, nutrition, and the bigger picture of poverty in India.

1. MALNUTRITION IN INDIA

India's population of one billion can boast the title “Most Malnourished Country.” The progress of the past ten year's battle against malnutrition has left the country in literally the same place they started. There has been economic growth, a surplus of food, but still, the hunger remains.

The biggest deficiencies in India are Vitamin A, iron, and iodine. The government has worked to implement supplementation programs to the citizens of India, but the problem remains. Over half of the population suffers from anemia, and despite the mandate that all salt be iodized, only half of the country consumes iodized salt on a regular basis.

Vitamin A deficiency largely causes problems with the eyes. One of the conditions associated with a lack of Vitamin A is xerophthalmia which leads to nutritional blindness without intervention. Symptoms of vitamin A deficiency include night blindness, bitot spots on the eyes, corneal ulceration, and eventually corneal scarring. Vitamin A deficiencies are caused by ignorance, poor diets, frequent childhood infections, and poverty. Treatment can be given in the form of supplementary doses of vitamin A, consumption of foods high in Vitamin A, or fortification of foods to contain Vitamin A.

The iron deficiency causes widespread problems among every age group, but causes the most severe problems for young children and women. 70% of girls and 69% of boys suffer from anemia. In adults, 56% of women and 24% of men have anemia. Part of the problem with iron deficiencies is obvious—the consumption of iron rich food. However, there is another problem associated with the absorption of the iron consumed. Iron deficiencies can cause higher rates of infection, affect mental ability, affect reproduction, and cause a poor work capacity. Treatment and prevention can be changed through diet, iron supplementation, and in extreme cases, blood transfusions.

The lack of iodine in the diets of many Indians can also cause a host of problems. Iodine deficiencies can cause goiters, which is a swelling of the thyroid gland. Other problems include cretinism, abortions, still births, congenital anomalies with babies, infant mortality, and impaired mental function or retardation.

By no means are these the only forms of malnutrition that Indians suffer from. In fact, India has the largest group of non-immunized children in the world. Approximately 30% of the babies born in India are considered low birth weight (under 2.5kg). Malnutrition is a cycle that begins at birth. In India, only about a quarter of the newborns begin to breastfeed within an hour of birth. This low incidence of breastfeeding is problematic because beginning breastfeeding within that first hour can reduce mortality of the infant by up to 22%. The first two years of a child's life is when he/she is most susceptible to malnutrition, and when the most difference can be made.

Once these children get a little older, a fifth of the population under five is wasted. The children that suffer from severe acute malnutrition rarely receive treatment. In fact, less than 0.1% of the children suffering from severe acute malnutrition ever get treatment. Starting at about adolescence, there are more problems for girls than for boys, due to gender inequities within the country. In many cases, men will be the first to receive health care, food, and education within a family. Education is correlated with the health of future children, so a lack of education of the women perpetuates this cycle of malnutrition.

Hygiene is also another source of malnutrition in India. Only 48% of the country has proper sanitation coverage. This large amount of open defecation causes bacteria and disease to flourish. Only 30% of the population washes their hands before cooking, 38% before eating, and 53% after defecation.

With all of these problems, the Indian government is trying to take action; however there are problems with what has been done. Take the example of the noon meal scheme. The noon meal scheme aims to provide one meal a day for all children at schools that contains one-third of the daily nutrient needs. This program has several justifications. Unfortunately, the largest justification was political (to confirm support for a particular political party). Other justifications were more honorable and included nutrition, employment, welfare, health, education, and social benefits. There is debate as to if the program is a nutritional success. In some cases, there are no measurable changes on the health of the children. The program doesn't necessarily reach those that need it most. The village elite or administration have been known to take advantage of this program insuring that it never reaches the children. The meals don't reach the poorest of the poor, since oftentimes those children still won't go to school. Many of the children would go to school until the meal was served and then leave. In this example, it is clear that the problem is not the policy making but within the execution of the plans. This is oftentimes held in the hands of people outside the government and policy making.

This host of nutrition problems leaves an ambitious task for the Indian government, and for the world. India has everything from "invisible hunger" in the form of micro-nutrient deficiencies, to gender inequity, to poor hygiene, and even problems with obesity. This wide range of problems hurts the nation, and must be conquered.

2. THE IMPORTANCE OF VEGETABLES

Vegetables can provide a whole host of nutrients that aid in the fight against malnutrition. Different groups of vegetables are able to provide carbohydrates, protein, B complex vitamins, Vitamins A, D, E, K, Calcium, Phosphorus, Iron, Folic acid and more. Vegetables can be grouped into several types based on their nutrients and structure.

The first group is the roots and tubers. The roots and tubers are the plants where the root part is taken for consumption. This includes onions, potatoes, carrots, sweet potatoes, beets, and turnips. These are a good source of carbohydrates, and oftentimes Vitamin A. Roots and tubers can be difficult to grow in poor soil (especially when the soil is very rich in clay and dry) because the roots are sometimes unable to get large enough with the pressure of the hard soil on them.

The next group is the leafy green vegetables. Leafy greens include lettuce, spinach, and several indigenous vegetables like basella and kangkong. Green leafy vegetables are especially rich in iron (although there can be problems with the bio-availability and absorption of that iron). Other nutrients present in leafy greens include Vitamin A, C, D, E, K, Calcium, Phosphorus, folic acid, and zinc.

Thirdly are the Pulses. Pulses include all legumes. Some examples include vegetable soy bean, ground nut, and cow pea. Pulses are high in protein, and are very important for fighting protein energy malnutrition which affects a large portion of India. They also contain many important vitamins and minerals (Vitamin K, phosphorus, calcium and more).

A fourth important group is the fruit-type vegetables. These are the vegetables that we eat the fruit from. That includes tomato, peppers, and okra. Many of these are high in beta carotene, lycopene, and Vitamin A.

There is a huge variety in vegetables, but the most important thing to consider is a balance of the vegetables. The home gardens aim to have vegetables from all the different categories at all points during the year to ensure that proper nutrition is being received by the family. For vegetables that are not available throughout the year, vegetable processing is an important factor. Proper storage, freezing, or canning techniques for various vegetables should be used to ensure best nutrition and safety of the product.

3. HOME GARDENS

A very useful tool in the fight against malnutrition and poverty is the home garden model. AVRDC-RCSA has developed a healthy diet gardening kit that makes implementing a home garden easier and more fruitful. The parameters of a home garden are very wide. A home garden can be defined as “an area around the home where different vegetables and fruits are grown throughout the year to meet family nutritional requirements.” With these guidelines, home gardens can be grown anywhere. Common locations include the following: in one plot near the home, in several plots near the home, in containers on a roof or balcony, vertically near a home, or even hydroponically.

Home gardens are very useful to supply some of the necessary nutrients, but they can also provide a host of other benefits. Once they have fed the family, the surplus can be processed or sold in a market for additional income. Fuel can come from the tree and shrub plants used in the home garden. The garden also provides the family with herbs and spices. In addition, the flowers can be used as decoration, or to sell. Home gardens can also supply other less obvious benefits. They can reduce cash outlay for food, provide a better taste, and reduce the amount of harmful pesticides in the food source. The gardens also offer physical and mental well-being benefits to the family.

Potential problems and restraints of the home garden model have been considered and addressed. The first common problem is a small amount of land. This can be dealt with by making the home garden in a non-traditional shape, or growing certain vegetables in conditions that only they like. For example, amaranth and sweet potato can be grown in shady places, and mint and coriander can be grown around a well.

A second possible constraint is the question of labor. Many families are busy and have little time. Depending on the size of the garden, having the entire family pitch in can easily make the labor less. Continuous hard labor is not necessary to make the home garden a success. The next potential problem is the scarcity of money. Many families will not have the income to purchase fences, hybrid seeds, or expensive gardening tools. In these cases, natural fencing made of shrubs, homemade compost, and biological methods of pest control can be useful. Expensive hybrid seeds should not be purchased, since seed collection from these plants will not necessarily yield a good

offspring. Local and Indigenous plants will do much better in home gardens since they are well suited to the climate.

The next problem is poultry damage. In India, a lot of livestock is not contained, and poultry (and other animals) roam free. In these cases, live fencing can be made to prevent the chickens and other ground birds from entering the garden. Water can be the source of many problems. If the garden is in a flood prone location, care should be taken to grow crops that are flood-resistant. In addition, improved drainage system and raised beds can minimize the damage. On the opposite end of the spectrum, drought can have disastrous consequences. In these areas, crops requiring less water should be grown. Covering the plants and soil with material such as banana leaves and water hyacinth can increase the moisture to the plants. Adding more organic matter or mulching the crops can do a superb job to retain the little available moisture.

The model developed by AVRDC-RCSA as a standard for comparison and research is a six meter by six meter area. The vegetables have been carefully selected based on the various groups needed (legumes, leafy greens, fruiting vegetables, etc), as well as growing season, climate, and soil conditions. There are garden models for three different locations including Hyderabad, Punjab, and Jharkhand. The different gardens contain different vegetables and thus different nutrients.

The Hyderabad Model contains twenty-one vegetables throughout the year. The model was analyzed for protein, iron, calcium, beta-carotene, Vitamin C, and Zinc. The numbers are based on a serving of 100 grams. The Punjab model has twenty-six vegetables, and the Jharkhand model has twenty-two.

Hyderabad Model

	Protein (g)	Iron (mg)	Beta-Carotene (µg)	Calcium (mg)	Vitamin C (mg)
Amaranthus	4.5	18	NA	321	NA
Basella	2.8	10	7440	200	87
Bitter gourd	1.6	0.61	126	20	88
Bottle gourd	0.62	0.2	0	26	10.1
Brinjal	1.4	0.38	74	18	12
Chenopodium	3.7	4.2	1740	150	35
Chili	2.9	4.4	175	30	111
Coriander	3.3	1.42	6918	184	135
Cowpea	3.3	1	NA	65	33
French bean	1.7	0.61	132	50	24
Garlic	6.3	1.2	0	30	13
Kangkong	2.8	3.27	1130	156	51
Kasuri Methi	4.2	2.38	6560	NA	48
Lablab Bean	3.8	0.83	187	210	9

Lettuce	2.1	2.4	990	50	10
Mint	4.8	15.6	1620	200	27
Okra	1.9	0.35	52	66	13
Onion	1.2	0.6	0	46.9	11
Radish	0.7	0.4	3	35	15
Ridge Gourd	0.5	0.39	33	18	5
Spinach	2	1.14	5580	73	28
Sponge Gourd	1.2	0.61	120	50	0
Tomato	0.9	0.64	351	48	27
TOTAL	58.22	70.63	33231	2046.9	792.1

Punjab Model

	Protein (g)	Iron (mg)	Calcium (mg)	Beta Carotene (µg)	Vitamin C (mg)
Amaranthus	4.5	18	321	NA	NA
Basella	2.8	10	200	7440	87
Bottle gourd	0.62	0.2	26	0	10.1
Brinjal	1.4	0.38	18	74	12
Broccoli	2.82	0.73	47	361	89.2
Capsicum	1.3	0.57	10	427	137
Carrot	0.9	1.03	80	1890	3
Chili	2.9	4.4	30	175	111
Chinese Cabbage	1.5	0.8	105	2681	45
Coriander	3.3	1.42	184	6918	135
Cowpea	3.3	1	65	13	33
Cucumber	0.4	0.6	10	0	7
French bean	1.7	0.61	50	132	24
Garlic	6.3	1.2	30	0	13
Kangkong	2.8	3.27	156	1130	51
Kasuri Methi	4.4	1.93	395	2340	52
Lablab	3.8	0.83	210	187	9

Lettuce	2.1	2.4	50	990	10
Longmelon/wanga	0.35	0.5	NA	13	0
Mint	4.8	15.6	200	1620	27
Okra	1.9	0.35	66	52	13
Onion	1.2	0.6	46.9	0	11
Radish	0.7	0.4	35	3	15
Spinach	2	1.14	73	5580	28
Sponge gourd	1.2	0.61	50	120	0
Summer squash	0.5	0.6	10	0	18
Tomato	0.9	0.64	48	351	27
TOTAL	60.39	69.81	2515.9	32497	967.3

Jharkhand Model

	Protein (g)	Iron (mg)	Beta-Carotene (µg)	Calcium (mg)	Vitamin C (mg)
Amaranthus	4.5	18	NA	321	NA
Basella	2.8	10	7440	200	87
Bitter gourd	1.6	0.61	126	20	88
Bottle gourd	0.62	0.2	0	26	10.1
Brinjal	1.4	0.38	74	18	12
Chenopodium	3.7	4.2	1740	150	35
Chili	2.9	4.4	175	30	111
Coriander	3.3	1.42	6918	184	135
Cowpea	3.3	1	NA	65	33
French bean	1.7	0.61	132	50	24
Garlic	6.3	1.2	0	30	13
Kangkong	2.8	3.27	1130	156	51
Kasuri methi	4.2	2.38	6560	NA	48
Lablab	3.8	0.83	187	210	9
Lettuce	2.1	2.4	990	50	10

Mint	4.8	15.6	1620	200	27
Okra	1.9	0.35	52	66	13
Onion	1.2	0.6	0	46.9	11
Radish	0.7	0.4	3	35	15
Ridge gourd	0.5	0.39	33	18	5
Spinach	2	1.14	5580	73	28
Sponge gourd	1.2	0.61	120	50	24
Tomato	0.9	0.64	351	48	27
TOTAL	58.22	70.63	33231	2046.9	792.1

For the Punjab model, weekly data was used to calculate the total nutritional yield for each week, month, and finally the year as a whole. The following table includes the amount of the particular nutrient needed by a family of four as well as the average monthly yields of that nutrient in the home garden.

	Protein (g)	Iron (mg)	Beta Carotene (µg)	Vitamin C (mg)
Average per month	510.35	568.2	397955.61	7728.99
Amount needed	5910	2940	264000	54000

From these results, the home garden can supply a good amount of the needed nutrients. Certain nutrients (such as protein) are more difficult to get from vegetables. Beta Carotene was the only nutrient that was available in surplus. One of the problems with the nutrient flow is that it's not steady. All of the crops cannot be grown at the same time, so food processing becomes necessary. Food processing can take many forms. For Indian cooking, pickles and sauces are the most common. Other methods include freezing, drying, irradiating, and canning.

Although the only nutritive values calculated were from the Punjab model, the yield is taken and measured on a weekly basis from the other two models. All available produce will be harvested, weighed, and recorded. So far, the home gardens show somewhere between 250 and 300 kilograms of produce annually. This is significant in reducing expenditure on produce as well as increasing health.

When caring for a home garden, there are many practices that are necessary to maintain a healthy garden. One of the first steps is soil preparation. Much of the soil in India is poor. Therefore, it is necessary to ensure that proper compost is applied to add nutrients to the soil. Good components of compost include farm yard manure, decomposed vegetable matter, vermicastings, and wood shavings. These help hold moisture in and can reduce the amount of weeding necessary in the garden. The soil must also be sterilized to kill of any sort of disease or insect pest that may be harbored in the soil. This can be done by setting straw on the soil and burning it, or laying a plastic sheet over the area for an extended period of time.

The next factor to carefully monitor is the seed health. Seeds must be purchased from a reliable seed source. In most cases, the seeds are collected from year to year, so the quality needs to be excellent. Varieties that are indigenous to the area will be much hardier and perform better. Seed treatment is another helpful method. This can toughen seeds up and protect against diseases or insect pests. On a similar note, transplanting should also be

done very carefully. Different plants are ready to move outside at different stages in their lives. Transplants should be watered carefully.

Selecting a plant to harvest seeds from is key to future generations of the garden. Plants with diseases or visible insect pests should not be selected. The hardy plants with the healthiest fruit should be chosen. Harvesting the seeds depends on the type of plant. Oftentimes, once a plant is selected for seeds, it sits in the field longer than the other plants so that they seeds can fully mature. Other plants should be harvested when mature. This of course varies from plant to plant.

4. RECIPE PREPARATION

The next step for the home gardens is consumption of the fresh vegetables. To do this, delicious and nutritious recipes must be available. In many cases, the recipes prepared were classic Indian dishes with a few modifications for added nutrition. The majority of the recipes were prepared using only a hot plate. The recipes were different depending on which garden model was being used (because of both available vegetables and regional preferences). One of the important factors that needs to be considered while cooking is nutrient loss. Every different method of cooking has different impacts on the various nutrients. For example, boiling leafy greens has significant losses of Vitamin C and Folates. These nutrients can be retained somewhat by keeping the water and using it in broths and other recipes.

Two weeks were spent on preparing various dishes. For every dish prepared, a panel was surveyed about the taste, texture, consistency, flavor, and appearance. The nutrition of the various recipes was also calculated (theoretically). The ingredients were weighed before and after cooking. The recipes included a wide variety of vegetables including potato, capsicum (bell pepper), brinjal (eggplant), bottle gourd, bitter gourd, methi (fenugreek) leaves, basella, kangkong, and tomatoes. Legumes and nuts were also included for added protein. Ten recipes plus one American vegetable recipe that I contributed were prepared and tested by the member of AVRDC-RCSA.

Analysis was done of the nutrients per serving to determine the nutritive benefits of the various vegetable recipes. The values were calculated from “The Nutritive Value of Indian Foods.” Nutrient retention percent was then calculated as well by taking an average of the retention of all of the individual ingredients. All of these calculations are theoretical.

Nutritive value of the recipe per serving- Brinjal Curry

	Protein (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Carotene (mcg)	Folic acid (mcg)	Vitamin C (mg)
Nutrients per serving	8.638	188.54	19.72	2.74	474.03	54.393	21.92
%RDA met per serving per person	15.71%	20.16%	4.93%	9.45%	19.63%	54.393%	54.79%
Nutrient retention (%)	100%	100%	100%	100%	89%	76%	72%

Nutritive value of the recipe per serving- Spinach Cucumber Soup

	Protein (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Carotene (mcg)	Folic acid (mcg)	Vitamin C (mg)
Nutrients per serving	1.7925	109.7	68.75	1.257	2908.025	61.5	29.2375
%RDA met per serving per person	3.26%	11.73%	17.19%	4.335%	121.17%	61.5%	73.09%
Nutrient retention (%)	100%	100%	100%	100%	90%	75%	68.33%

Nutritive value of the recipe per serving- Fenugreek Potato Curry

	Protein (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Carotene (mcg)	Folic acid (mcg)	Vitamin C (mg)
Nutrients per serving	7.38	163.1	249.68	2.09	1230.93	6.55	27.79
%RDA met per serving per person	13.41%	17.44%	62.42%	7.19%	51.29%	6.55%	69.48%
Nutrient retention (%)	100%	100%	100%	100%	92%	79.2%	73%

Nutritive value of the recipe per serving- Kangkong Stir Fry

	Protein (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Carotene (mcg)	Folic acid (mcg)	Vitamin C (mg)
Nutrients per serving	5.88	139.88	110.05	2.30	3460.125	75.46	27.43
%RDA met per serving per person	10.70%	14.96%	27.51%	7.93%	144.17%	75.46%	68.58%
Nutrient retention (%)	100%	100%	100%	100%	90.33%	77.22%	75%

Nutritive value of the recipe per serving- Basella with Buttermilk

	Protein (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Carotene (mcg)	Folic acid (mcg)	Vitamin C (mg)
Nutrients per serving	3.079	91.28	56.206	1.27	2232.3	58.952	18.275
%RDA met per serving per person	5.60%	9.76%	14.05%	4.39%	93.01%	58.95%	45.69%
Nutrient retention (%)	100%	100%	100%	100%	93.33%	78.33%	68.33%

Nutritive value of the recipe per serving- Capsicum Paneer

	Protein (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Carotene (mcg)	Folic acid (mcg)	Vitamin C (mg)
Nutrients per serving	6.50	113.38	160.59	1.65	358.85	11.78	57.61
%RDA met per serving per person	11.82%	12.13%	40.15%	5.69%	14.95%	11.78%	144.02%
Nutrient retention (%)	100%	100%	100%	100%	88.33%	75%	84.17%

Nutritive value of the recipe per serving- Mint Coriander Chutney

	Protein (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Carotene (mcg)	Folic acid (mcg)	Vitamin C (mg)
Nutrients per serving	2.23	42.55	32.08	1.14	488.16	2.47	10.42
%RDA met per serving per person	4.06%	4.55%	8.02%	3.95%	20.34%	2.48%	26.06%
Nutrient retention (%)	100%	100%	98.33%	98.33%	90%	77.5%	82.5%

Nutritive value of the recipe per serving- Ridge Gourd Masala

	Protein (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Carotene (mcg)	Folic acid (mcg)	Vitamin C (mg)
Nutrients per serving	5.51	105.09	105.61	1.56	326.61	20.077	16.77
%RDA met per serving per person	10.02%	11.24%	26.40%	5.38%	13.61%	20.08%	41.92%
Nutrient retention (%)	100%	100%	100%	100%	87.5%	73.33%	86.67%

Nutritive value of the recipe per serving- Beans and Carrot Fry

	Protein (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Carotene (mcg)	Folic acid (mcg)	Vitamin C (mg)
Nutrients per serving	5.14	203.63	101.76	2.09	1138.3	38.58	19.84
%RDA met per serving per person	9.3%	21.78%	25.44%	7.24%	47.43%	38.58%	49.61%
Nutrient retention (%)	100%	100%	98.57%	98.57%	88.57%	74.29%	77.14%

Another aspect of the recipe preparation was sensory analysis. This was done by two or three people for each recipe and rated on a scale from 1 to 5, 1 being the worst, 5 being the best. These results were compiled to make sure that the recipes were tasty and would be well received as a means of increased vegetable consumption.

Sensory Evaluation of Recipes

Recipe	Appearance	Taste	Texture	Flavor	Consistency
Basella with Buttermilk	3	3	3	3	3
Kangkong Stir Fry	4	4	3.5	3	3.5

Spinach Cucumber Soup	3.33	3.67	3.67	4.33	3.67
Capsicum Paneer	3.67	4.33	3.67	4.67	3.67
Brinjal Curry	3.67	4	3.33	3.67	3.67
Mint Coriander Chutney	3	3.33	3.33	3.67	4
Fenugreek Potato Curry	4	5	4	4	4
Ridge Gourd Masala	3.33	3.67	3.67	3.67	4
Bean and Carrot Fry	4.33	4.33	3.67	4	3.67

5. SURVEY OF VEGETABLE PRODUCERS

To learn more about the practices of vegetable sellers (potential growers) a questionnaire was developed to interview sellers at the Lingampally Vegetable Market. The questionnaire included basic information such as age, gender, and main occupation. It proceeds to ask about how long the seller has been selling vegetables, which vegetables are sold, and where the vegetables come from. The next part deals with farming/gardening practices in regard to growing the vegetables. This includes pesticide use, pest management and any problems they might have with selling/growing. The vegetable consumption habits of the seller are also examined.

Twenty people were surveyed, seven women and thirteen men (with the help of Dr. Triveni translating). The main occupation of all but two participants was selling vegetables. The two that had other jobs as well both worked in the construction area. The average age of the vegetable sellers was 37.05 years, and the average number of year selling vegetables was 8.75. One man had been selling vegetables since childhood, and several people did not know exactly how old they were. Three of those interviewed did not grow any of their vegetables, one grew her own and purchased them from elsewhere, and the other sixteen grew all of their own vegetables. The average farm size was 2.25 acres. The chemical use was very high, many of the farmers would spray their vegetables weekly. There were only two people who did not use anything other than cow dung and urea on their farms.

Many of the farmers and sellers had similar obstacles. The rain had caused problems for many of the farmers. One farmer was unable to cultivate anything due to heavy rains. Another common problem was the cost of transportation. Most of them used autorickshaws to bring their vegetables to market, and they would charge anywhere from 25-100 Rupees. In addition, there is a 20 Rupee charge to sell at the market. The farmers were at a disadvantage at the market. Those who purchased their vegetables from another source and didn't grow them were able to get better locations and more space at the market. One farmer told us that he was constantly moved around and didn't get enough space. As a whole, the average participant made 95% of their income from selling these vegetables.

The final item that participants were asked about was their vegetable consumption. They were asked how many members were in the family, and then how many kilograms of vegetables were consumed a day. From that, the average consumption per person per day was calculated. The average of the vegetables consumed per person per day was 171.8 grams. This number is well below the recommended 500 grams per person per day.

Many of the farming practices used by these vegetable sellers were not the safest for consumption. The biggest issues are the weather, and the costs of transportation. In addition all of the chemicals are very pricey (much more costly than the transportation). Yet, no one complained about the price of chemicals. There are problems with the infrastructure of the market, since farmers are discriminated against. In addition, there were zero families consuming the proper amount of vegetables, and these are people that have ready access to vegetables. If this is the consumption of those with access to vegetables, what is the consumption of those who must purchase all of their vegetables? One question in regard to this left unanswered is if the low vegetable consumption is due to ignorance or poverty.

6. NUTRITIONAL ASSESSMENT OF AVRDC-RCSA

Malnutrition is obviously a huge problem in India (and the world), but not a lot can be done about malnutrition if it can't be recognized. There are four main tests for nutrition. They include the anthropometric assessment, biochemical assessment, clinical assessment, and dietary assessment. They all look at different aspects of health in different ways.

Anthropometric assessment includes looking at measurements such as height and weight. Body mass index can be used as an indicator of over-nutrition, and mid-upper arm circumference is used to check under nutrition through muscle development. Anthropometric assessment techniques can also include waist circumference, hip to waist ratio, height for age, weight for age, weight for height, and chest circumference. Some of these tests are exclusively for children, but they are easily measured and calculated. There is no difficult equipment involved. The drawbacks of anthropometric assessment include an inability to detect malnutrition until the body is already suffering from its affects. In addition, anthropometric assessment cannot detect any sort of micro-nutrient deficiencies.

The second method for testing malnutrition is the biochemical assessment. This sort of assessment involves testing blood or urine samples for the presence of certain micro-nutrients. These tests can be difficult, costly, and hard to transport, but for certain problems, they can detect the lack of micro-nutrients before the body starts suffering from symptoms. Biochemical can detect many micro-nutrient deficiencies that anthropometric assessments don't have a chance of seeing.

The next method of detecting various kinds of malnutrition is the clinical assessment. Clinical assessment is another very portable way of measuring malnutrition. This involves looking at various symptoms of the body that are indicators of certain deficiencies. For example, Vitamin A deficiencies can cause bitot (white) spots on the eyes. These things can be detected through a clinical assessment. Parts of the body that indicate malnutrition include fingernails, tongue, mouth, eyes, knees, hair, teeth, and skin. This assessment is not foolproof. Many of the problems with the body could be indicators of other diseases, rather than malnutrition. In addition, if malnutrition is being detected in this stage, it has progressed further than if it was detected by a biochemical assessment.

The final type of malnutrition assessment is a dietary assessment. This one can be time consuming and difficult to execute on a large scale. To get an accurate picture of a family's diet, they can be asked to fill out a food diary for a set period of time. Other methods include a 24 hour food recall (participants recall all of the food eaten the

previous day) and a food frequency chart (participants say how often and how much of certain foods they consume). This technique does not require special equipment, but can be a bit difficult to carry out on a large scale. Oftentimes, people won't know how much of a certain food they have consumed, so having a standard of bowls, spoons, and cups to show the participants can help the assessor determine the amounts of food consumed.

In order to develop a well-rounded nutritional assessment, more than one of the techniques should be used. In addition, other information is necessary to analyze the information such as age, income level, education, gender, and an assessment of nutrition knowledge. The nutrition knowledge assessment shows whether or not a person's nutrition/malnutrition is due to ignorance or if they actually know.

When developing the nutritional survey for AVRDC-RCSA, the form included several categories. The first was for general information (gender, income, education etc). The next was for nutrition knowledge. There were five questions concerning the recommended types and amounts of food and the presence of micro and macro nutrients. The third section contained questions about health (chronic conditions, diseases, hospitalizations, and common problems). Section four was when the real assessment started. Section four contained the anthropometric assessment. In this case, there was height, weight, body mass index, ideal body weight, waist circumference, hip circumference, waist-hip ratio, and mid-upper arm circumference. Some of these numbers were calculated afterward (ideal body weight and body mass index). The next section contained a clinical assessment. The parts of the body that are typically impacted by various micro-nutrient deficiencies were assessed, and the participants were asked if they had any problems with any of them. The final section was a dietary assessment which included a 24-hour dietary recall as well as a food frequency chart (with amounts consumed).

The necessary tools to conduct this assessment were a flexible tape measure, ruler, 100 gram bowl, 300 ml cup, and 5 gram spoon. Eight participants from the office were assessed, three men and five women. The results were compiled and analyzed in a spread sheet and individual results were typed up in a printout to be given as recommendations to the individuals. No biochemical assessment was done due to the difficulty of completing such an assessment.

The first category included general information. The average age of the participants was 31.8 years. Half had their PhD, three had a college degree, and one had no college education. Those with PhD's averaged 4.75 out of 5 on the nutritional knowledge test and those without averaged 2.5 out of 5. The health questions yielded no warning signs for any sort of micro-nutrient deficiencies.

Under the anthropometric assessment, the average overall, for men, and for women was calculated and then compared to the standard. The anthropometric results showed no major deviations indicating malnutrition. Over-nutrition was a larger problem than under-nutrition in the assessment. The standards were for Indians, or calculated by the generally accepted formulas.

	Average	Average women	Standard women	Average men	Standard men
Height	166.7	159.8		178.2	
Weight	65.88	62.4	59.8	71.7	78.2
BMI	23.66	24.4	18.5-25	22.22	18.5-25
Waist circum.	84.38	80.2	<80	91.33	<90

Hip circum.	101	103.2		97.33	
Waist-hip ratio	0.84	0.78	<0.8	0.94	<.95
MUA circum.	29	28.4	>20	30	>23

The clinical assessment showed minimal problems. A quarter of the participants had problems with hair loss, which can be caused by anemia (lack of iron) and is very common in India. The other problem that cropped up was poor eyesight (many of the participants wore glasses). This could be due to a Vitamin A deficiency, but none of the other symptoms were there.

The dietary assessment showed some major nutrient lacks and overeating in certain areas by most of the participants. The results of the 24-hour dietary assessment showed that on average the women were not consuming the recommended amount of Kilo-calories, iron, or visible fat. The men consumed more than the recommended amount of every category (Carbohydrates, Kcal, protein, iron, calcium, and fat).

	Carbohydrates (g)	Energy (Kcal)	Protein (g)	Iron (mg)	Calcium (mg)	Fat (g)
Average	433.82	2269.23	85.06	22.9	677.55	20.94
Average Women	363.27	1653.16	59.42	19.06	501.9	13.51
Standard Women	*	1875	50	30	400	20
Average Men	496.71	3293.35	127.8	29.3	970.3	30.76
Standard Men	*	2425	60	28	400	20

*varies by weight, 2-2.5 carbohydrates per kg of body weight is the accepted amount

The food frequency chart showed that the majority of participants did not consume the proper amount of fruits and vegetables daily. Protein consumption was also low for several participants due to their vegetarian diets. However, most did consume some sort of pulse/legume daily which adds protein to the diet. The main recommendations made to the individuals in their reports included a higher consumption of fruits and vegetables, and a decreased consumption of fats and oils. Some participants were overweight, and others did not have sufficient protein.

7. CONNECTING THE DOTS

For part of my studies, I was able to take a trip to the National Institute of Nutrition in Hyderabad. I spent hours reading books and journals and came out feeling a little depressed. So many of the conceptions out there about hunger are so wrong. These are conceptions that I once clung to. In India, the programs are in place. The government is trying to solve the problem. The thing is, there's no enforcement and there's no way to reach the people that really need help the most. If the policies are in place, what else can the government really do? And like most countries, the problem in India is not the lack of food. There is in fact a surplus of food in the country.

After a summer full of the most thorough and intense education I could possibly imagine, I feel saddled with a responsibility. I honestly don't feel closer to solving world hunger. In fact, I feel further away than ever. However, I became inspired. I was inspired by my friends and supervisors who were all working on different things to solve the problem. I know now that I can't stop. I've been exposed to this, uncovered a bit of truth about the world and I

am saddled with responsibility to continue working. How can I be fully happy if I know that somewhere out there over a billion people are starving, and all that separates me from them is a bit of nasty luck?

What most people don't recognize is the amount that chance plays in our world. It could literally be you living in that hut made of bamboo sticks and tarps, your whole life in four square meters. That could be your little brother wasting away on the street median. That could be your mother, walking several hours a day to get water for your family. So how can anyone be happy with their lavish lives when they did nothing to deserve it?

On the flip side, it's ridiculous to spend your life miserable because so many people in the world are. Working hard, never giving up the fight, and being grateful for the life you were lucky enough to be born into is all you can do. Once you are equipped with the knowledge of how powerful and widespread poverty is, there is a sense of responsibility. With that responsibility, comes the need for action.

VII. CULTURAL EXPERIENCE

India is an experience. To be honest, I didn't have many expectations. I was so caught up in preparing for the trip and graduating high school to think too much about what it might be like. India is a huge country, and my experience was limited to the Hyderabad area. The one thing that never ceased to amaze me about India was the contrasts. I could stand in front of the world's largest 3D IMAX theater and see cows in the street. I could see hundreds of cars bumper to bumper on the street and little children sleeping on the median. I could see men urinating on the side of the road next to shops blasting Kanye West's music. India is not a single idea. India is a tumultuous word that encompasses hundreds of ideas that range from one end of the scale to the other. It's an experience.

Like any culture, there were things that got lost in translation. I explained cooties, cream cheese, and lowan license plates, all in one week. I struggled to understand how the caste system still impacted society, but didn't want to be insensitive and ask too many questions. I wondered if you could ever get used to the sad eyes of children on the streets. I was grateful every single day for the luxurious campus I lived on, even on days when the power (or water or internet) would go out. I figured out how the campus works through my friends and lots of seemingly silly questions. I learned that the bucket in the shower was for showering, but could also be used for laundry. I learned that the cafeteria will serve you bowls of vegetables (or ice cream!) if you ask. I learned that the TV channels were slightly different in every room. I learned that India doesn't make sense to outsiders, and that's okay. You learn what you can, and embrace everything as an experience. Good, bad or ugly, you still get something out of it.

I correctly assumed that I would learn a lot about Indian culture. I visited temples, mosques, forts, and ancient buildings. The history of Hyderabad is rich and much older than the history of the United States. Most of my intense cultural learning, however, came from my Indian friends and from my supervisors at work. I would constantly ask questions, trade music, trade movies, and try to understand. The part that I didn't bargain for, was learning about so many other cultures. I had close friends from England, Burkina Faso, Sudan, Niger, Spain, Ethiopia, Germany, Canada, and of course from all over India. Other acquaintances I made were from Sri Lanka, Australia, France, Taiwan, Indonesia, and China. The best parts of the day were mealtimes when we would all gather up and share our days and then share our cultures. Topics ranged from learning languages, to the political system of each respective country, to arranged marriages and wedding traditions, to popular music, and everything in between. Evenings were spent with a closer group of friends, sometimes cooking, playing our homemade Scrabble game, laughing at Indian TV, or having three hour conversations about world issues.

A lot of my cultural education came from my office. Everyone was very patient with me as I would ask the name of snacks during tea time, and proceed to take pictures of every food that I didn't know (and then ask them how to spell it). They showed me where things were on campus, and took me on my first autorickshaw experience (imagine a smart car with no doors, no seat belts and full of six people) and my first train experience. They made me an expansive list of words and phrases in Hindi and Telugu and then didn't laugh (too much!) when I tried to pronounce things. One of the best parts of my internship was the cooking. Since I was working with home gardens and nutrition, a key factor was the cooking. That meant in addition to helping with the recipe research and testing, I was able to learn Indian cooking (and then I took it home to my friends at ICRISAT for further testing!)

Whenever I would go out into the city, I would feel like some sort of spectacle. People would always stare, autorickshaws full of people would all start waving at me, children would practice their English, and I was overwhelmed by all of this unusual attention. One evening, as we were leaving a temple to retrieve our shoes, a man approached us. "Photo? Photo? Photo please?" At first, I thought he might be asking me to take a picture of his wife and him with the temple in the background, but that was not the case, as I soon learned. His wife got in the picture with us, and he took a picture. Several pictures. All of a sudden there was a wave of people asking for photos. We posed with children, entire families, alone, it was endless. The one man that was brave enough to ask opened the floodgates. Eventually we escaped, and laughed about how we knew what it was like to have the paparazzi follow you. There were two explanations that I could find for this. The first was that Hyderabad isn't a very touristy place, so they might not have seen many white people. The other is that within the caste system, the higher castes have lighter skin, and the highest caste includes the priests, so by having lighter skin, we were closer to God. The emphasis on having lighter skin here was very obvious. There were TV commercials about whitening cream, advertisements for brides or grooms in the paper always claimed to be "fair skinned." It made me sad that this was so emphasized in the media.

India's wonderful rich culture has become a part of me. I look forward to the Indian meals that I will share with my family and friends, wearing my Indian kurtas and sharing so many adventures that will sound like something out of a movie. India will always be a part of me, it has taught me so much. Someday, in the foggy future, I look forward to returning and seeing more of what this glorious and fascinating country has to offer.

IX. CONCLUSION

The roads of India are not only full of the usual vehicles (cars, motorcycles, and autorickshaws), but with vehicles you would never imagine. There are people trotting along the road on the backs of camels. There are oxen pulling carts of construction materials and men. There are motorcycles carrying five people. There are cows and goats wandering through the streets. Like these streets, India and my summer internship were full of unexpected things. Every surprising thing I learned was like another stray dog running into the road. The exciting experiences I had flew by like camels on the edge of the road.

These roads are the first thing I saw of India, and as I leave, they will be the last. The traffic has taught me much, and caused me to leave my comfort zone. India was far beyond the end of my comfort zone. As they say, life expands or contracts in proportion to one's courage. Gathering up the guts to get on that first plane from Des Moines, Iowa, has opened a new world. It has introduced me to a plethora of information, and given me responsibility and inspiration to work to end poverty and hunger. There is so much to be done, but there are so many people working. I am not alone.

As the traffic surrounds me, I am confronted with all of humanity. From those well off in nice cars, to those standing on the sides of the roads begging, and even those riding camels, we are all human. We are all here together on this planet for a brief wild life and that's it. How on earth can we let humanity go unnoticed.

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