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Agroecology on the Ground in Telangana, India

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Agroecology

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FOREWORD

This thesis, Agroecology on the Ground in Telangana, India, is the result of a four-month visit, travelling through India examining the ecological agriculture movement. It was heavily influenced by the program it is written for, NMBU's Master's program in Agroecology. The program emphasizes the innate complexity and multi-dimensionality of food and farming systems. It was an appropriate background to the Indian agricultural scenario which is incredibly diverse, complicated and resembles little of my experience working on farms in Canada.

It is divided into two parts. The first chapter encapsulates a descriptive case study of the organization I was working with that operates in ecological agriculture, the Centre for Sustainable Agriculture (CSA). It acts as background information for what the ecological initiative entails in India. The second chapter is an independent study (externally of the CSA) of the ground realities of ecological agriculture and uses grounded theory methodology to investigate the transition process to ecological farming. Both chapters have independent formatting outside this thesis as they are meant to be submitted to different journals.

For my first trip to India and to sustenance farming systems, I chose a very constructivist approach to my research. The infrastructure, soils and climate were such a contrast to what I was accustomed to that I felt it was important to proceed with my study without too many preconceived ideas of what the situation was. Following the Centre for Sustainable Agriculture and assisting in projects where possible was a great opportunity to see how an organization operates in the ecological agriculture sector and gave a slight internship aspect to this whole research.

ABSTRACT

The emerging science of agroecology requires frameworks for its conduction. This two-part thesis first documents the ecological initiatives of the Centre for Sustainable Agriculture (CSA) in Telangana, India and then uses grounded theory to investigate the transition process of farmers adopting ecological farming practices. Despite a growing economy and images of modernity from an emerging high-tech sector, persistent farmer suicides reveal the agrarian situation in India as a crisis. The solutions which were chosen to alleviate the years of hunger of the 1960's are now showing increased consequences: loss of soil fertility, depleting groundwater levels and deskilling of farmer knowledge replaced by costly market made solutions. The call for an ecological age aims to remediate the above scenario given that it applies modern ecosystem understanding to new and old practices alike. Rather than advocating an input intensive approach, recognizing the complexity and regenerative capacity of agroecosystems leads to a knowledge intensive approach to the design and management of food and farming systems. The proposed grounded theory illustrates that the realization of ecological transition requires the appropriate knowledge, incremental adoption of practices and ultimately a solidarity and trust towards the alternative techniques. Through education of ecological principles and the building of institutions that favour such production schemes, organizations working in ecological agriculture, such as the CSA, are a prime example that a fair agriculture, which alleviates hunger and improves livelihoods, is possible through the implementation of sound agroecological principles.

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INTRODUCTION

Agroecology is defined as a holistic science based in local knowledge (Altieri, 2005). Rather than an approach consisting of input intensive solutions, it recognizes the inherent complexity of agro-ecosystems and their regenerative capacity and thus advocates a knowledge intensive approach (Savard et al., 2014). Agroecologists working in the field know that action at one end of the agri-value chain may be futile if efforts are not made on the other end. For instance, helping small and marginal farmers with non-pesticide management without helping them access fairer markets may fall short of improving livelihoods. As such, any efforts towards improving livelihoods or environmental conservation requires action at virtually all levels within the agri-value chain.

The choice of actions must not only be well intended; they must be effective. Attempting to solve a problem with the same mindset that created it is impossible, as Einstein famously noted. The current agricultural development agenda of the World Bank and World Trade Organization (WTO) include further liberalization of agricultural trade and reduction of the state's role in food production and distribution while promoting the corporate sector (which includes foreign corporations) and cash crop production for export (Nair, 2008). These policies are persistently advocated despite a growing agrarian crisis in India (Ramanjaneyulu, 2015) and protests from peasant farmer coalitions across the world (Grain, 2015). Record profits by agricultural transnational corporations, such as Monsanto bringing in 15.1 billion USD in revenues in the fiscal year of 2014 (Glick, 2015), hint towards the undeclared motives that shape global agricultural development. While organizations such as the WTO seeks to be democratic, it becomes an arena where countries with different socioeconomic weights and policies, as well as diverging interests, ultimately confront each other (GRET, 2007). The Green Revolution is often referred to as a success, but that is not the unanimous opinion observed on the ground in rural India.

In order to solve the agrarian crisis with environmental considerations, the field of agroecology is emerging. Several organizations have faith in the field (La via Campesina 2014, Oxfam 2014, Action Aid 2012), perhaps because it is rooted in a different science than conventional agriculture. A common definition of agroecology is the application of ecological concepts and principles to the design and management of sustainable agricultural ecosystems. It is a study which is inherently interdisciplinary, which voices stories and issues that are often silenced in popular research and recognizes multiple realities through the use of local knowledge for local solutions. Such a definition is heavily rooted in a postmodern tradition. To give a singular definition of what agroecology is would be inconsistent with postmodernism, which emphasizes plurality (Lafrance, 2009). This research documents the ground realities of the mobilization of agroecology in Telangana, India, in order to obtain a richer understanding of its struggles and potential as a viable farming system for those interested in joining the movement.

THE INDIAN SCENARIO

The success of India's development in the past century is heavily contested. Images of 'Incredible India' alongside the various emerging high-tech hubs and an economy growing on average 7.3 per cent in the last quarter of 2015 (Trading Economics, 2016) depict the country being on a fast track to development. Alongside these features, the country is also home to the highest amount of undernourished people, 194 million, accounting for 15.2 per cent of the population (FAO et al., 2015). Persistent farmer suicides, claiming 16,000

individuals a year, epitomises the agrarian crisis currently happening in India (Ramanjaneyulu, 2015). To invest in either the industrial or agricultural sector is an age old debate in India: grow the economy or assist the masses. Industrializing the agricultural sector has been the recourse of the 21st century.

The agricultural development schemes of the 1960's, namely the adoption of hybrid seed, chemical inputs, irrigation and mechanization (referred to as the Green Revolution), were implemented at a time of great starvation, and many people are thankful for the increases in yields the country attained. A senior scientist I spoke with at the International Crops Research Institute for the Semi-Arid Tropics relates his experiences:

Despite having money, I have seen hunger. Because, while my parents had money, there was no food grains available in the market. Even sometimes in that black market. Sometimes, if you remember that, tears will come. We grew up with the shame of imported food grain.

While many hold beliefs in Green Revolution practices for assisting in alleviating hunger, skeptics amount as well. Patel (2013) offers an eloquent discourse against the acclaimed yield increases of the Green Revolution. Successful or not, the consequences of these practices are now becoming increasingly apparent: staggering in yields as a result of deteriorated soils, climbing cancer rates from chemical exposure, and the depletion of groundwater are realities that are widely acknowledged and documented (Nicolaysen, 2012). Furthermore, this system of intensive industrialism has been kept in place to a point where farmers themselves have become a commodity. On the issue of farmer suicides, Chandra et al., (2015:2) point out: "There is always a continuous denial by the government. Some of the state governments like Chhattisgarh and West Bengal changed the way data are being reported and suddenly started showing a big decline in farmer's suicides".

The current agricultural development paradigm of further market liberalization through cash cropping and intensive technological inputs has largely ignored helping Indian farmers improve livelihoods with simple and accessible ecological practices. The high investment costs of modern seed, fertilizer and pesticides is a yearly risk that often results in a continuous indebtedness on the farmer's counterpart. Estimates as high as 94 per cent of farmers cultivating less than 10 acres accumulate a yearly deficit (National Commission for Enterprises in the Unorganised Sector, 2007). The theoretical hegemony which dominates agriculture today becomes an issue; the deskilling of the farmers is addressed as traditional knowledge is left behind in exchange for market solutions (Kumbamu, 2007).

Pursuing with business as usual is to disregard the struggle faced by the agrarian community and further jeopardizes ecosystem health which we depend on for our continued survival. There are several movements afoot which challenge the status-quo and offer alternative ways for farmers to produce crops and manage their environments. These movements are rooted in ecological agriculture.

THEORETICAL FRAMEWORK: AN ECOLOGICAL LENS

Ecological agriculture is a promising venue to address the agrarian crisis in India today because it can remediate the consequences introduced by Green Revolution technologies and aggravated since. Loss of soil fertility, depletion of groundwater, biodiversity reduction and reformation of policy are some of the issues addressed in ecological agriculture.

Ecology goes beyond the popular sense of environmental protection that it is often popularly referred to. It is the branch of biology that studies the interrelationships between organisms and their physical environments. Recognizing the practicality and necessity of ecosystem health, ecology then becomes an ethical issue whereby its assessment is done in a holistic, multi-dimensional analysis of social, economic and environmental factors. Thus, Hayward (1995) distinguishes a threefold definition of the term ecology as the relation of an organism to its environment, ecology as biological science, and ecology as value system or philosophy.

Extending this frame of thought to agricultural systems is in fact a change of paradigm as to how the study of agriculture has been conducted over the past 100 years. For instance, many agricultural universities have their environmental (or ecological) department separate from plant and animal sciences. The scientific discourse which is influencing current food systems today is rooted in key premises that challenge ecological science. It is now difficult to keep up with the rational certainty that western thought adopted in the Age of the Enlightenment; ecosystems are inherently complex and often respond in unanticipated ways. The atomic and mechanical worldview of Newton or Darwin's alleged contribution that everything happens under competition, was popularized by the industrial revolution and heavily influences capitalist modes of production. For example, measurement of a country's progress through the export orientated approach of Gross Domestic Product (GDP). Homesteading skills such as basket weaving, harvesting from the wild and seed saving provide innumerable socio-ecological benefits. According to GDP, however, these acts do not contribute to quantified economic growth and are so forth determined dispensable. Newer sciences, such as systems theory or quantum physics, recognize a greater complexity: interrelation of all things and scientifically assess that the whole is greater than the sum of its parts. Such is the frame of thought that ecological agriculture, or agroecology, is based on.

Gaining a better understanding of ecosystem dynamics can translate into completely different approaches to management styles. In conventional systems, nutrient management is understood as a chemical property. Determining the required input involves counting nutrients and understanding soil like a bank account. The manure required by these calculations is exorbitant and rarely available in such amounts; mineral fertilizer then becomes a necessity. An ecological approach, rather, focuses on enriching the health and microbial life of soils; manure could be applied as a fermented product or urine as a foliar spray. The innate nutrients of these products are lower but their biological capacity to generate natural soil processes are immense, leading to a much lower application rate. Likewise, in pest management, current thought is to eradicate pests by killing them whereas the ecological approach is to restore a balance and have nature deal with any virulent pest issue itself.

The ecological design of food and farming systems goes beyond biological considerations. The country of India is referred to as a sub-continent to account for its vast diversity. It has been pointed out that "Scotland is more like Spain than Bengal is like Punjab" (Guha, 2007:11). However, policy regimes to manage hunger problems at the country level have been tailored only to the staple crops of rice and wheat. A minimum support price is guaranteed for farmers and food is then subsidized by the government and redistributed to the people at low prices through public distribution systems. Areas of the country which are more suited to millets and whose people have historically eaten it as a

staple crop fall outside of these assistance programs. Farmers are therefore obstructed to diversify their cropping systems; denying such foods is a form of political oppression (Deccan Development Society, 2012). Instead of the classical approach of 'crop-per-drop' to maximize yields, agroecologists now speak of 'nutrition-per-drop' to mitigate hunger.

Unfortunately, despite there being a plethora of successful stories and examples, ecological agriculture in India is generally distrusted. It is misunderstood as the replacement of modern methods for traditional ones and seen as a step backwards to highly laborious techniques for low yields. While it may lack markets and infrastructure in comparison to the conventional system, successful ecological agriculture is innovative and achieves the well-being of villagers through local resources.

Recognizing that ecological agriculture has become a movement, this research is interested in how farmers build trust in the ideology. The purpose of this research is to investigate the ground reality of ecological agriculture in India and specifically the transition phase in regards to how communities get over the bad stigma and adopt ecological farming practices.

OBJECTIVES

- Investigate the capacity of ecological agriculture in arid and semi-arid regions of India.
- Identify barriers to the execution of this system.
- Investigate the transition process of building trust in ecological agriculture.

RESEARCH QUESTIONS

How is ecological agriculture materialized on the ground in India?

How and why are traditional smallholder peasant farmers accepting ecological farming practices?

METHODOLOGY

This study was done in collaboration with the Indo-Norwegian Cooperation Programme Action research and education in Agroecology where funding was dispensed to select Norwegian University of Life Science master level students to conduct field research in India. A four-month internship was spent at the Centre for Sustainable Agriculture (CSA) in Hyderabad, India. There I had the opportunity to gain an understanding of the situation of ecological agriculture in India, study the mode of operation of the home organization and network with affiliated staff and across other initiatives of ecological agriculture in the region.

As my first visit to India and to arid/semi-arid sustenance agriculture, my research was done in two steps. Firstly, I wanted to document the mode of action of the CSA which would provide background information on how ecological initiatives are performed in India. This portion made use of the case study approach. Case studies have an advantage over other research methods when a how or a why question is being asked about a contemporary set of events over which the investigator has little or no control. Also it permits the use of multiple sources of evidence (Yin, 1994). As an established organization, many publications and online resources were available for consultation. At the onset of my research, the strategy entailed contacting field staff of the CSA, travelling to their location of work, interviewing them and the farmers they were associated with.

As I gained a better understanding of the agrarian situation in India and made more contacts, my research then focused on examining the ecological transition of farmers: how they gained trust and solidarity in ecological agriculture. For this portion of the research, use of snowball sampling, whereby contacts I made referred me to other farmers, allowed me to reach a wider network and information in addition to those associated with the CSA.

To achieve the above, I conducted semi-structured, intensive interviews to gain a deeper understanding of a person's experience with ecological agriculture (See appendix I for interview sheet). Accompaniment of a translator was often necessary for me in villages where none of the inhabitants could speak English. The interviews were then translated, transcribed and analyzed according to constructivist grounded theory (Charmaz, 2014) (See appendix III for further information).

Interview transcriptions were my primary source of data. I analyzed these in several rounds of coding in order to create a theory that was grounded in the data. The first-step, line-by-line coding, is an explanatory way to fragment and begin to categorize data where an annotation is written next to every line of the transcribed interview describing what is happening or being spoken of. Disaggregation of core themes found forms the second level of coding named axial coding. These second level codes were listed in an excel document and any pertaining citations were added under them. Also, select second level codes were further explored through memo writing. Explaining the interrelations found in second level coding was done through a third level of theoretical coding. Here, second level codes are grouped together, and their accompanied citations form the basis for the creation of a theoretical model which is then proposed to explain the current situation. The theory is grounded in the research and is not meant to be held as a grand theory; rather as an explanatory device to get a better understanding of how people are accessing ecological practices. This is congruent with the post-modern, pluralistic nature of agroecology.

Most of my time was spent in the states of Telangana and Andhra Pradesh, where the CSA is located. However, opportunity presented itself to travel to West Bengal, Uttar Pradesh, Uttarakhand and Rajasthan, where I also conducted interviews. In total, 24 farmers and 16 specialists in the agricultural industry were interviewed, 78 per cent of whom were male, 22 per cent female, having a collective average age of 45.5 years (see appendix II for a list of interviewee demographics). Published material from various organizations in India working in the ecological field was also analyzed as a secondary source of data.

PART I – Agroecological Solutions Across the Agri-Value Chain: A Case Study on the Centre for Sustainable Agriculture in Hyderabad, India

This chapter entails a case study describing an organization successfully working in ecological agriculture. Through the analysis of their various projects and modes of actions, the case study as a whole gives one example of how agroecology is materialized 'on the ground'. Given that agroecology is an emerging science, frameworks for its conduction are required. The various solutions across the agri-value chain by the Centre for Sustainable Agriculture (CSA) in Hyderabad, India offer a framework for those who either may not be convinced by ecological farming practices or who are but do not know how to execute them. Noteworthy is that while this case study is a success story, whoever wishes to replicate a model like such must adapt it to their local conditions; local knowledge leads to local solutions.

CENTER FOR SUSTAINABLE AGRICULTURE

Located in Hyderabad, India, and operating in four states, the CSA is a non-profit trust that has gained reputation within India as an organization with expertise in ecological agriculture. Today, the organization consists of over 50 employees and is 80 per cent self-sufficient through income generation from their extension services and sale of publications. It is forecasted that within three years, their operation will be self-sustaining and not require outside funding.

Their effectiveness is impressive: in the districts of Yavatmal and Wardha of Maharashtra, they are working with 1,750 farmers, 41 per cent of which are completely pesticide free and 19 per cent are organic with the remaining portion in various stages of shifting. In the state of Andhra Pradesh, CSA works directly with over 5,000 farmers where community managed sustainable agriculture is practiced on more than 3.5 million acres across 22 districts through women self-help groups.

In June 2012, the general director of the CSA took part in the popular television show 'Satyamev Jayate' which discussed the dangers of conventional agriculture and organic farming as a solution to pesticide residues in food. The large-scale entrance of organic issues into the mainstream media and public discourse has been important for the ecological movement. Some organic shop owners even speak of 'Khanverts' – customers who discovered and 'converted' to organic food following the show's screening (Osswald and Menon, 2013).

Since their debut in 2004, their mode of action is to not perform work based on call, but to go to areas which are experiencing a crisis given that there, any incremental change has noticeable outcomes. They are highly constructive in their approach, with more emphasis on identifying their starting point as opposed to a determined destination at the onset of a given project. A beginning point of their work is often non-pesticide management (NPM); helping farmers reduce their pesticide applications saves them money, helps their health by reducing their exposure to harmful chemicals and reduces environmental pollution.

Non-Pesticide Management

Today, we can reasonably establish that pesticide use can be downgraded. At least reduced by more than 50 per cent - Ramanjaneyulu, Director, CSA.

An inherent belief of the CSA is that pest outbreaks and disease are not a symptom of their own, but reflect a greater disturbance in the ecosystem. Pesticides in India are notoriously misused and abused as a result of poor policy, greedy chemical dealers and lack of institutional support (Ramanjaneyulu, 2015). Rather than investing in a single product, the CSA believes that preventative measures throughout the crop cycle, accompanied by the necessary knowledge, can free farmers from costly inputs. The necessary knowledge is not to be taken lightly. Since the Green Revolution, farmers have increasingly depended on the market for all their needs. In a single generation, farmers in India have gone from complete self-sufficiency to complete market dependency, resulting in the deskilling of farmers (Kumbamu, 2014). Reintroducing traditional techniques as well as new ecological solutions is part of the knowledge intensive practice that has made the CSA reputable.

While many of the farm inputs of NPM can be fabricated at the farm level from local ingredients, they require timely application. In the words of Raju, the co-op leader from the Enabavi village, a village consisting of 50 families who converted completely to organic

production in 2005: “Whatever may come you may control in timely action, but if you pass, you may not control”. CSA’s mandate is not to sell products to farmers; they only sell publications. Rather, their work consists of educating farmers on pest and disease cycles and at what time to act. On-farm concoctions work foremost as a prevention. Farmers who are not proactive or knowledgeable will have to depend on conventional pesticides when an outbreak occurs.

Naturally, these NPM solutions are not as practical as buying a product off the shelf. Concoctions and decoctions must be fabricated and timely applied, often in large quantities as compared to the minute active ingredients of conventional pesticides. Farmers must change their mindset about their practice; the CSA believes that it is up to the farmer to gain trust in the ecological practice:

We believe in an incremental shift. Not a shift determined by market or ideology. When we go to a village and a farmer uses, say, 14 sprays of a pesticides, we will tell them, it can be reduced by 50 per cent. So it is a win-win for both. So then they see it can be done 60-70 per cent. We have seen 80 per cent of the farmers reduce like that - Ramanjaneyulu, Director, CSA.

Always working at the village level, their work begins with a community wide intervention where they introduce their work following with the necessary training to perform NPM. The CSA will return at the end of the season and ask the village who has applied conventional products. The farmers who have lost faith in NPM during the crop cycle and sprayed are interrogated if they followed the set of prescribed practices. Often they have not. The establishment of farmer cooperatives, farmer field schools and demo plots has helped build better practices at the community level. Marappa, a 53-year-old farmer from Mudimala tells us of his experience with such training systems:

They gather us here [to this demo plot] from time to time to see these organic methods in practice. It’s good to bring the village together, we get to discuss our struggles, some share interesting solutions they have found, even it has come to make groups to produce these farm based-pesticides... I think this format [farmer field school] is good, it really makes us cooperate, I realized that we are all going through the same problems so we may as well help each other.

In years of drought or severe disease, farmers are at a threat of loosing an entire crop, regardless of their practices. Reducing the consequences of a crop failure through the reduction of costly inputs would alleviate debt and increase livelihoods, despite a crop loss. Naidu, a reputed organic farmer in Taramathipeta village, noted: “Last year at this time, all was green. But this year, because of power failures, we have lacked water and lost many crops. But my inputs are low, so it is no big issue”.

Often the chemical retailer is also the money lender; farmers gets caught in a debt trap that they cannot be liberated from. The notorious farmer suicides are often related to this debt burden. Refraining from using costly inputs would increase the margins of farmers and help them get out of debt.

There is still a strong belief today that crops can simply not be grown without conventional pesticides. However, many people are doing it. The best way to dismantle such skepticism is to go out and see for oneself how this is being done in the field. To consider the true health of a farming practice, one must not only look at yield as is so often done. An

organic farmer with lower yields compared to his conventional neighbor can deem his season a success if his monetary gains at the end of the season surpass his neighbor's as a result of avoiding costly inputs. An added benefit of growing food pesticide free, is that farmers then access a competitive market.

Farmer Producer Company: Sahaja Aharam

Sahaja Aharam (translates into: natural food) materialized in order to bring a fair price to the farmer and a healthy product to the consumer. While working on a livelihood project, a solution arose to organize farmers into groups and organize these groups into cooperatives. This was not the initial plan of the livelihood project, despite livelihoods being improved through co-ops. Keeping with their mode of operation, CSA was lenient and flexible while the funding agency for that specific project was not. They decided to part ways and CSA continued with the co-op initiative. Today, CSA has successfully organized 10 cooperatives, each consisting of 100-200+ farmers. The produce from these ten cooperatives is marketed through the producer company Sahaja Aharam. At least 50 per cent of the retail price of the food sold is returned to the farmers, compared to 20-30 per cent on the mainstream market. The remainder is kept as a service cost for transport, packaging and marketing.

It took several years to bring Sahaja Aharam to the scale it has today. They began by funneling funding from other projects of the CSA for employee salaries and held a market stall once a month:

When we started, there was no physical store like today, we held a monthly market. We would introduce new customers to farmers by telephone so they could directly meet; customers could directly talk to who was responsible for their food and how it was grown. That went on for a few years. That worked well, I think. We have no need to advertise today, happy customers spread the word themselves - Sahaja Aharam General Manager.

Beyond its own store front under the CSA office, an online store offers deliveries in Hyderabad. The company acts as a referral system for other organic stores in the city to market excess food of the cooperatives which they cannot sell themselves.

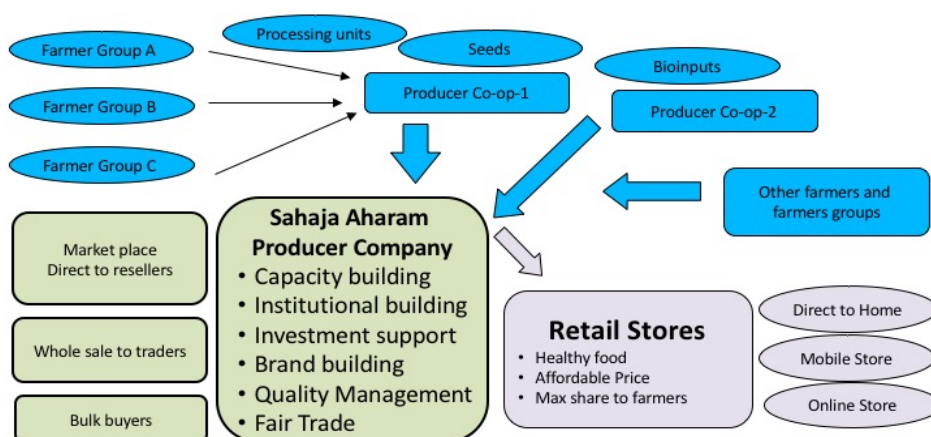


Figure 1 - Sahaja Aharam Producer Company, source: CSA

Beyond offering a competitive market outlet, member-farmers benefit through:

- Technical support from the CSA.
- Cross-linkages to institutions and other farmers' organizations which helps access inputs such as seed, compost and other bio-inputs.
- Increased market place power and easier access to loans either through its own Value Chain Fund or through Joint Liability Groups.
- Encouragement and assistance towards processing for a value added benefit in hopes of reaching superior market prices rather than raw agricultural products.

Assembling farmers into cooperatives is also a vehicle for skill and resource sharing. Some villagers may initially be skeptic to the idea as it could be another scheme to take advantage of farmers. Misti, a 44-year-old farmer from Visakhapatnam tells us about her initial contact with the co-op idea:

At first [CSA] came here and told us of all the wonderful things that would happen if we joined their society. There was a small fee and I was unsure. Then, they gave us some seed and organized some trainings for us... They are even in the process of buying a part of our harvest. Good things will come from this society; I am sure.

Likewise, the agrarian reality in India, of 'fragile' soils containing low organic matter levels and small land holdings makes having livestock for manure an important and complicated issue that cooperatives can assist in. Partha, a natural farmer and cooperative initiator in Anantapur explains:

If you want sustainable [agriculture], you need cows, there is no other way. But today landholdings are so small, suppose in my village, everyone cannot have cows. So under a cooperative society, you can hire two-three people and then buy some 10 cows and everyone shares resources, share cow dung, share preparations.

The cooperative society then goes beyond reaching organic premium prices, but underlies a communal farming strategy that Jackson (2005) stresses has been discouraged since colonial ideas of progress. Following the non-profit basis of the CSA, part of the profits generated from Sahaja Aharam are used as investment funds in a Value Chain Fund for new farmers to inspire them in organic production or to help the village acquire value adding processing equipment:

We charge services on each packet. If we charge 50 rupees for a packet, we have to keep a fraction for transport, packing, cleaning, and marketing charges. We end up accumulating a surplus; this is our small savings we give to encourage more farmers into organic farming. We like to have funds aside to help community infrastructure projects, like helping a village get a seed cleaner - Sahaja Aharam General Manager.

Remaining profits are distributed as dividend-equity to the shareholders. Today, the store serves as an outlet for seed, health products and publications as well.

Development Dialogue

The development dialogue is an association initiated by the CSA for promotion of a meaningful dialogue on development through visual, electronic and print media. Because many issues that are brought to discussion question or critique governmental development

strategies, establishing the development dialogue as separate from the CSA was intended to maintain the professional reputation of the mother organization. Voicing stories of the oppressed and unheard is in itself controversial in popular research and media who often wish to keep matters at status quo.

Farmer suicides, land reforms, seed ownership...all these are complicated, controversial subjects. Some may think it is easier just to ignore them, but that will just worsen the issue. Through the professional discourse of Development Dialogue, we are voicing these issues, providing hard facts and compelling stories. The dialogue format raises awareness but remains open to other opinions in hopes of reaching a middle ground. It is a continuous, and difficult talk, but it has to be done - Ramanjaneyulu, Director, CSA.

The mandate of the Development Dialogue is to (1) create awareness, knowledge and skill building on the ecological restoration of agrarian landscapes and sustainable rural economy, (2) pose questions and explore complex issues from a variety of perspectives in order to gain a deeper and shared understanding, and, ultimately, (3) challenge the assumptions of current development. Various platforms have been established to reach this goal. Development Dialogue includes: Tolkari, a monthly magazine intended for producers containing various articles of ecological production, Agriwatch, a website that compiles news about the agricultural situation in India, Krishi TV, an online resource of various videos about agriculture, and eKrishi, an online portal for learning and extension service. Beyond these platforms, numerous publications from the organization have been released in various languages depicting the agrarian situation in India. These have brought in a significant income for the organization:

These publications, they are not free. We charge for them so that farmers know they have a value and that if they choose to purchase them, will put the effort into reading them as opposed to taking free material and setting it aside... As an organization, we do not sell products, we dispense knowledge... I think our publications are of high enough quality to be worth what we ask for them, and people are willing to pay for them - Extension officer, Kurnool District.

Events are also organized, bringing together various organizations and farmers en-masse to raise political awareness regarding the agrarian situation. On April first to third 2016, the CSA played a large role in the third Kisan Swaraj Sammelan (Translated from Hindi into: Independent farming conference) that took place in Hyderabad. Over 500 farmers and professionals working in the ecological agriculture industry were assembled. The focus of the conference was wide-ranging and included topics such as free trade and agricultural livelihoods; woman farmers' rights; hazardous agri-technologies like pesticides, fertilizers and genetically modified organisms; seed sovereignty & diversity; land rights; economic policy impacting Indian agriculture; climate change and consumer support/empowerment. Such sort of events permits exchanges of knowledge, perspectives and initiatives among the ecological agriculture sector that builds solidarity and public awareness. This type of information is the pre-required knowledge to form the appropriate institutions for ecological agriculture, such as locally based seed banks and farm level breeders.

Community Seed Banks to Community Seed Enterprises

Seed is the beginning and often the end product of agricultural production. It is inherently a self-regenerating resource, one that will adapt to local environments and can be selected for desired traits. The commodification of seed and removal of them from the public sector through patent ownership is not only eroding biodiversity, as modern varieties are bred for and sold through vast areas, but is making them increasingly inaccessible. Boddu, and organic farmer from Kshera Sagar offers an important perspective:

It has come to the technology that is meant to save us is destroying us. A packet of hybrid seed, which must be bought year after year, can cost 30x more than a local variety which seed's can be saved. We just cannot afford modern seed.

Domesticated plants and landrace varieties are the result of a common heritage of breeding efforts by all farmers throughout history. Within only one generation, farmers have passed from active producers of seed to passive consumers of the market. As a result, agricultural deskilling is being accelerated and the skills which created the foundation of agriculture are disappearing from farmer knowledge (Kumbamu, 2007). Helping farmers regain control of their seed contributes greatly to their livelihoods and has great biodiversity implications as well:

The enquiries about suicides in Warangal District revealed that all the farmers who committed suicide adopted seed replacement with high yielding, high cost, low volume hybrid seeds...the rate of suicides by the farmers is directly proportional to the rate of seed replacement ... There has been as many as 120,000 varieties of rice in the country, adopted to different environments and selected and evolved by farmers for specific human needs. These varieties are a product of nature's affection for diversity, eagerly husbanded by indigenous science (Ramarao, 2015:27).

In order to provide villages with the necessary infrastructure for seed sovereignty, since 2004 the CSA has helped established seed banks in 70 villages in Andhra Pradesh and 20 villages in Maharashtra. These were initiated with the help of local NGOs who identified areas willing to initiate community level seed work. Meetings were called to discuss the issues faced with seed and to introduce alternative models. With enough support, a community seed bank would be established, managed by five community volunteers. The displacement of traditional cropping patterns for the prominent crops of wheat and rice has effects at the societal level:

It has been experienced time and again that the destruction of food sources disempowers women and on the other hand, marginalizing women from agriculture further jeopardizes food and nutrition security of a household (Ramanjaneyulu, 2015:63).

Thus in the establishment of seed banks, the CSA requires at least three out of five of the acting members to be women. Traditionally, seed saving was the woman's duty. Going to the market for seed has made their skill, efforts and input obsolete.

These seed banks fulfill more than the revival of crop and variety biodiversity; it is an opportunity for farmers to develop traits that interests them. While high yield or disease resistance is often the trait bred for by private companies, it was observed that farmers have other, more prominent desires:

We did research with ICRISAT and participative research with woman farmers. They released a pigeon pea variety using this approach. After testing it, we told them, yes it grows well, yes the yield is good...but it has no taste and taste is our primary purpose in what we do and so sorry, we will not be using this [variety] - Director, Deccan Development Society.

Table I - Motivation for adopting traditional varieties

Parameter	Frequency	Percentage	Rank
High nutrition	50	100	I
Cultural Use	50	100	I
Suitability to local condition	49	98	II
Good taste	49	98	II
Fodder Use	49	98	II
Drought tolerance	44	88	III
Resistant to pest and disease	41	82	IV
Local demand	37	74	V
Good yield	27	54	VI

Source: Raja Shekar, G. and Sandhya Shenoy (2010)

CSA then introduces participatory varietal selection and participatory plant breeding to the initiated seed banks to continuously improve local varieties to local conditions and to the desired traits of the seed users. To expand genetic material, they also network with similar agencies at the state and national level and acquire germplasms from research stations and universities.

After over a decade of working in the establishment of seed banks, the CSA found that one time trainings and investments are not enough to conserve and improve indigenous varieties. It is important to continuously engage in selection, multiplication and distribution of seed. Another noteworthy point is that while seed banks are successful in tribal areas where indigenous varieties flourish and food crops are high, commercial areas with a high level of monocultures are unlikely to adopt seed banks. Demand of uniformity in size, shape, colour, consumer preferences and processing demands make for a large dependence on hybrids. Agroecological initiatives are then hindered by market demands.

To mobilize the aspirations of the seed banks, seed grower associations (SGA) are formed consisting of 15 farmers, at least half of which are women. Their duty is to create a growing plan before the season to determine what seed will be grown. During the growing season, tours and field visits are organized to ensure quality control, and at the end of the season the required seed is bought by the seed bank or stored by the SGA. Important tasks

of the SGA include the documentation of activities and cataloguing of germplasms which the seed bank requires for proper operation.

The community seed enterprise is the apex body of the grower's association. Representatives from the SGAs are part of the general body of the producer company, Sahaja Aharam. While the SGAs are unregistered informal groups of farmers, the producer company is a registered body with all required licenses and permits to breed varieties, produce seed, brand and sell. Sahaja Beej (translates into: natural seed) is the branded seed marketed through the food cooperative grown by various SGAs that provide additional income for small and marginal farmers. Such initiatives have required much legal activity; the realization of these projects could not have happened without advocacy work towards government and policy.

Government and Policy: Top Down Approach

While many NGOs and grassroots organizations praise the need for bottom up approaches whereby citizens are empowered by taking charge of institutions themselves, to disregard the effect that policy has on the agrarian sector would be irrational. According to the Report on Conditions of Work and Promotion of Livelihoods in the Unorganized Sector (National Commission for Enterprises in the Unorganised Sector, 2007), the incomes of 94 per cent of the farmers who own less than 10 acres of land are lower than their living expenses. The need of a rational pricing policy in agriculture is imperative to get farmers out of their debt traps and risk of suicide. Working towards better policies and regulations for farmers is part of CSA's mandate:

Ecological sustainability and economic sustainability should both go hand in hand... Sitting here and saying organic farming is possible will never work. Unless it happens at the field level. And unless it happens at a scale...It is an issue of markets and public policy... ecological sustainability and economic sustainability at the farmer's level that was the core agenda with which we started with. - Ramanjaneyulu, Director, CSA

Some of the work currently done at the CSA includes tracking public investments in agriculture, various reports on the impact of chemical pesticides and GM crops on human health and environment, policy framework for ensuring income security for farmers, policy framework on ecosystem services, studies on climate change, impacts and adaptation, studies on agrarian crisis and farmer suicides.

The director of the organization stresses the nature of their credibility: "The credibility comes from good practice and scientific argument: not getting into [an] emotional environment but really getting into what the science is. Also be open from learning from others". A prime example of the effectiveness of good documentation and research is seen in the global ban of endosulfan in 2008:

10 years back, it was very difficult to go and talk to people saying growing crops without pesticides is possible. In 2008, in the global debate on endosulfan, India argued that endosulfan was essential for small scale farmers. We were on the other side, arguing that it is not necessary. So they put their data and we put our data and eventually the global [Stockholm] committee accepted our data and it was globally banned - Ramanjaneyulu, Director, CSA.

Likewise, in regards to Genetically Modified (GM) eggplant, the best evidence the CSA had against the technology were farmers who could do without the need of pesticides:

We had an agricultural minister in 2005. She read an article [about NPM]. She called us and said “is it true?” We said yes, go to the villagers and talk to them. She went and talked to them. She called us back and said that she was convinced and wrote an article in *Headline*... When the debate happened all over the country in regards to the decision of GM eggplant, the environmental minister of Andhra Pradesh (AP) said I know farmers in AP who grow without pesticides. He put a moratorium which has protected India from GM crops to date.

While many debates in agriculture are centered on technology in agriculture, agricultural land ownership is itself becoming an issue. A report on the shifting land use patterns in Andhra Pradesh states:

An analysis of the various policies in the last two decades indicates that the official discourse has been about moving out of farming and looking at other growth engines and sectors like industry to achieve growth rates. The justification for diversion of farm lands to other purposes, aided by amendments to existing laws or through formulation of new legal measures, is often justified on the basis of non-viability of agriculture and small scale farming in the face of competing demands from industry and other sectors on the same land... These patterns pose a serious challenge to farm lands, farming and food security in a big way (Seethalakshmi, 2008).

The production of such reports with the documentation of various statistics of the shifting land use patterns raises awareness at governmental level about development strategies that are often taken for granted. Small and marginal farmers by default command a smaller voice than industry. It is then up to organizations like the CSA to relate the struggles of farmers being forced off their lands and the effect it has on the whole food system.

Of late, one of their major projects has been in the public ownership of seed. To keep germplasm in the public domain, a world wide movement of open source patenting has been occurring (Kloppenborg, 2010, 2014). Open Source Seed Network (OSSN) is based on the logic that farmers are both users and innovators of technology, coupled with the idea of licensing under Creative Commons, Open Source License or General Public License. While such legal binding would keep seed in the public domain, the necessary legal jargon is an obstacle when accessing a population like marginal farmers of whom upwards of 62.22 per cent are illiterate (Raja Shekar, 2015). In order to successfully put such a system like an OSSN in place, not only do professionals need to be working at the policy level, but skilled extension specialists must be working at the field level to convey the information in a comprehensible manner.

OBSTACLES

Like many non-governmental organizations, staff workload is high in order to make due with the few resources available. At several instances when questioning a given staff member on what could be done to make their job easier, having more staff at hand was the answer. Often field officers operate in remote areas alone, being the sole staff to conduct assistance, training, documentation and communication with the head office.

Several of the field staff I met spoke of their mission to build institutions in a given area and leave to a new project once it is up and running:

What I am trying to do, is introducing the systems, where farmers should be able to run their own institute. I believe in introducing systems and turning the system into habits... So five to

six years down the line, I should not be associated with the farmers, I have to get out of it. And they should be able to run on their own. Not rely on me. - Raja, extension officer, CSA

This opinion from a field staff turned out to be an idealistic scenario when confessions from a colleague of doing the same type of training repeatedly in a village came out:

Sometimes we just do the same type of work, again and again, and it just does not catch on in a village... whatever we want to implement, it has to work for the farmers, what works in one place is different elsewhere with different village dynamics - Aayush, extension officer, CSA.

The nature of the work CSA does is not simply selling a product, but involves education, institution building and ultimately the mobilization of agroecology. Such an interdisciplinary science is inherently complicated:

When we talk about agroecology we strongly believe it is often seen as only an environmental related issue, or organic farming... we need to look beyond that, we need to look at socioeconomic and political profile and then that these forces are also part of the ecology so how do we bring in equity and equilibrium in all these fields together. I think that is the major challenge when we talk about agroecology - Ramanjaneyulu, Director, CSA.

An incredible amount of time and support are required to make successful shifts. The assistance is often made possible by outside funding, from international organizations working for the improvement of livelihoods, for example. Yet this poses another obstacle as along with outside funding come restrictions on what can be said or even worked on. In fact, one of the objectives of the organization is to move away from foreign funding as much as possible.

Their largest obstacle, however, is in the beliefs that conventional agricultural science is rooted:

The most difficult thing we face, even today, is convincing agriculture scientists. Because it is a belief system for them. They believe in a particular ideology; it becomes very difficult to explain. Despite having large examples, daily, I face questions. Still they say "is it possible?" I say, just go out and see, which they are not ready to do. So it is a belief system. Science has become a belief today. - Ramanjaneyulu, Director, CSA

The ecological shift that the CSA is promoting does not agree with the current agricultural paradigm that is largely held by agricultural universities, industry and government. Working at the ground level and voicing success stories has then been the strategy of the CSA to propel their ideology, as the director of the organization said: "Without farmers understanding and making a shift, an idea can never get transferred into a practice. And without a practice, a policy will never change."

SUMMARY of MODE OF ACTION

The Centre for Sustainable Agriculture distinguishes itself from conventional agricultural extension given that their modus operandi encompasses open source sharing, intensive use of local knowledge and local resources, flexibility, dialogue with various levels of shareholders and a constructionist approach to project work. The ethos of the CSA is best

captured in the director's opinion that "We need to build a network of organizations and individual farmers who believe in the principles of free sharing of knowledge and material."

The CSA succeeds in their work because of the continual application of these principles throughout the agri-value chain. Whether working with farmers, scientists or government, enacting an incremental approach mediated by dialogue and backed by sound scientific data has given them the respect that any organization in ecological agriculture requires to be deemed professional by outsiders.

CSA's work across the agri-value chain coincides with criticisms from Rosset and Altieri (1997) who point to the appropriation of sustainable agriculture by agribusiness. Pseudo-ecological movements advocate an input-substitution model without moving away from industrialized monocultures or Green Revolution-style farming that lays at the roots of the agrarian crisis. By CSA's own producer company that markets a variety of products and works at the policy level to enact fair pricing systems for other crops than solely wheat and rice, the CSA is working towards the true essence of agroecology and not the profit driven connotation of sustainable agriculture appropriated by agri-business.

As alluded to in the obstacle section, the execution of agroecology is the execution of a new science. Instead of market made inputs it utilizes knowledge of ecosystem processes. It is then an inherently more complicated system that requires participation from farmers. Making farmers innovators again as opposed to passive consumers of the market is a change that needs to happen at the societal level; modern agricultural technologies are simply not meant to be improved at the field level. Altieri (2002) argues that modern agriculture technology is not scale neutral and that resource-poor farmers (about 1.4 billion people) remain untouched by such technology. Agroecology becomes a platform to address production issues by a biodiverse agroecosystem able to sponsor its own functioning. The CSA mobilizes these changes by using innovative platforms such as farmer field schools, participatory breeding and having farmers themselves sit on the board of their producer company. Moving away from the intellectual prestige that is often held by science and working side-by-side with farmers is integral to developing the local knowledge that agroecology is founded upon. As one extension worker told me: "I learn so much from farmers, everyday... Sometimes I just relate to other villagers what a model farmer in the community is doing." - Adinarayana, extension staff, CSA.

Being a new movement or scientific paradigm, the field of ecological agriculture or agroecology is so often recognized as unscientific or even as a step backwards to alleviating hunger. It is not recognized by Francis et al.'s (2003) description as the ecology of food systems that fosters broader and interdisciplinary research teams leading to broader research questions and new innovative solutions for the problems faced by today's agriculture. The organization is thus extremely focused on professionalism in terms of communication and data collection all while remaining open to their mode of action and learning from others:

When you are talking, you need to be accurate, don't exasperate. Be accurate. You need to be clear. It is not a fairy tale. The farm economy is low not just because of the productivity or the production practices, it is also about public policy and markets. So saying, organic can save all the problems is as bad as saying Green Revolution can save all the problems. It is

not just about technology, one of the credibility of us is being open, listening to the problem, saying this is what we can do, this is what farmers can do. Be open on that - Ramanjaneyulu, Director, CSA.

To anyone who questions the efficacy of a successful organization in ecological agriculture, going beyond the published material and meeting the farmers to see their story is the most appropriate source of information, which is in fact what the CSA suggests.

PART II – Overcoming Stigmas: The Ecological Transition of India’s Agricultural Sector

This second chapter builds on the background information from chapter one. Having gained a deeper understanding of the ecological movement in India, this section focuses on how villages gain trust and adopt ecological agriculture.

PROPOSED GROUNDED THEORY

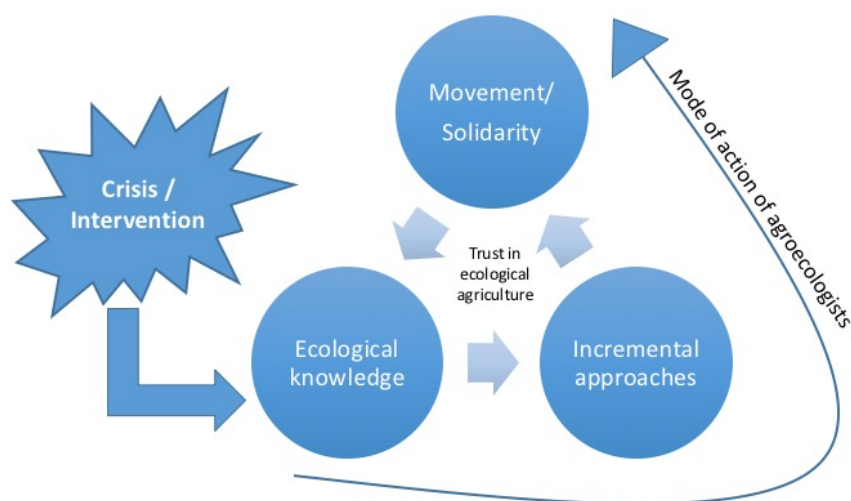


Figure 2 - Proposed Grounded Theory of Ecological Transition

Central to the calling for an ecological age in agriculture is a recognition of the ongoing crisis and a realization that there are alternatives to the status-quo. When a given village reaches its capacity, crisis then becomes a driving factor towards accepting and developing ecological practices. Ecological agriculture has distinguished itself from mainstream agricultural development and is now a movement. Adopting this paradigm is done in a three step cycle. Firstly, introducing ecological principles via training and field exposure. Then, implementing new knowledge is done in increments as trust has to be gained by the practitioners and the development of frameworks and institutions that are grounded in ecology need to materialize. The final stage in the adoption of ecological methods is a solidarity towards the movement whereby many of the premises of conventional agriculture are rejected. This process is assisted by the mode of action of agroecologists such as the initiatives seen in chapter one with the Centre for Sustainable Agriculture.

Crisis/Intervention

The villagers of Enabavi, which have completely transitioned to organic farming methods since 2005-2006, tell a rich story of agriculture in India and what can be done to get out of the chemical trap. It is an appropriate introductory example because their experiences

reflect the grounded theory mentioned above; an agrarian crisis leading to stepwise introduction of new knowledge and practices that, when having reached a critical mass, becomes a movement and solidarity towards ecological agriculture.

Enabavi: weathered signs announcing the 'Chemical Free Village' are posted at every entrance of the small village consisting of 51 households. The village is typical of rural India: small, simple houses are grouped in a settlement near farm fields anywhere between one-tenth to two acres in size. The village has always cultivated small plots without hired labour but only extended family to help with the various chores. In the 1970's, the village went through the typical process of increasing productivity by increasing chemicals. By 1995, the village had problems. Raju, the 62-year-old cooperative leader of the village explains:

Sometimes you may lose a crop due to a drought situation and other problems; pest, disease problems. That is what led to our debts. One time ... when we were using fertilizers, yields were coming down and using chemicals was increasing. We asked why our yields came down even though we were using more fertilizer? We also had a pest, the red hairy caterpillar. That was a problem. A serious problem. Our yields were going down and our investments up. The hairy caterpillar was a big problem, we were using a lot of pesticides but they were not effective.

This is a typical spiral that small farmers get caught in. Costly external inputs such as fertilizer, seed and pesticides are often all sold by a single merchant. These three-in-one dealers can also be the source of informal money loans to finance the growing season, which have exorbitant rates. When harvest comes, farmers have little choice but to sell the entirety of their crops to their lenders, often at poor prices. Inability to pay back loans leads to harassment from the vendors. In worse cases, farmers must sell their land to the financier and become landless workers, cultivating their previously owned land in a feudal sense. In villages, the money lending cartels are more feared than the police. Taking one's life may seem as the only option for many who wish to get out of the debt trap.

The village of Enabavi was in this situation, with deteriorated soils, accumulating debt and increasing health problems within the community. Their determination for better livelihoods and assistance from a local NGO, Centre for Rural Operations Programs Society (CROPS), led to the adoption of a multitude of techniques to control pests in contrast to the sole use of pesticides.

The lifecycle of problem pests was taught so that farmers could act on the pest in appropriate manner according to its development. Evening light traps were installed to capture the moths of the hairy caterpillar and bait was placed between the rows of crops to gather the caterpillars and dispose of them. A multitude of simple techniques have helped control the caterpillars to this day. When the American Bollworm appeared as a pest in cotton fields, likewise, a series of control methods were introduced according to its development. As I spoke to Raju, the co-op leader in the village, he would go into extensive explanations on how to prepare these locally based concoctions, when and how to apply them: "This neem seed extract is working for us to disturb the eggs [of the American Bollworm] ... The eggs rot instead of hatching. This is only effective at certain stages, afterwards you have to use a chili and garlic preparation." Raju reveals the ecological approach to pest control: several knowledge intensive yet simple practices in comparison to the sole dependence on pesticides.

The villagers of Enabavi were generally unfamiliar with these approaches to pest control given that 'progressive farmers' in India have been accustomed to going to the market for their cropping needs. With assistance from CROPS, farmers of Enabavi organized farmer field schools¹ to gather the village to select local fields and learn farm-based pesticides together. It then took several years for the entirety of the village to be convinced by these agricultural alternatives. Greater acceptance of organic farming was only accomplished when social standards accompanied the new practices: "As the farmers moved into more and more sustainable models of production, they realized the importance of natural and common resources for sustaining their livelihoods." The above comment from Ramoo, the director of the CSA who worked with the village, elucidates the required changes that are needed to completely adopt the ecological paradigm. It is a shift that is much more effective at the village level given the necessity of collectively using common lands for fodder and crop production, social regulations on groundwater and building of support when introducing new systems that some farmers fear may make them more vulnerable. Walking through the small village, one will notice social standards painted on walls which demonstrates the dedication of the village and their solidarity towards these new methods of production. As I took pictures of these murals, Kalyani, a 34-year-old inhabitant of this village, explained to me how these social standards help to reinforce the value of the extra effort of their farming style:

In organic farming, we have to climb the tree, we have to collect the leaves, we have to collect the fruit and we have to make the [decoction]. We have to spend so much time. In chemical [farming] they don't want to spend the time. They can spray everything in half an hour... As a village, we have seen that the organic method is better but to avoid temptation to any quick and easy [chemical solutions], we need social standards. We have to believe.

Today, Enabavi has many valuable lessons to teach other farmers. Not only on the execution of organic practices. They also have lessons to share on social regulation, learning from each other, the benefit of conviction born out of experience and most importantly, the way out of agricultural distress by taking control over one's own farming.

The system that was put in place in Enabavi would become what today is called Non-Pesticide Management, an ecological framework for pest control. The necessity of understanding and spreading these frameworks is imperative for the ecological movement and is discussed next.

Ecological Understanding

Because of the prevalence of conventional agricultural science and practices, people seeking to diversify their farming systems often did not know how or were hindered to do so. The ecological movement is extremely limited by lack of knowledge because it is inherently a knowledge intensive system (as opposed to input intensive in conventional systems).

As I visited the village of Birbhum in West-Bengal, this idea became apparent. The practice of flooding paddy fields forces all farmers who own small parcels within a larger field

¹ Farmer field school is a group-based learning process where participating farmers are brought to an active farm to be educated about production or pest control practices. The platform is not solely to teach a given skill, it is also a participative venue where farmers can share ideas and information. These events stress that farming is not merely about practices, it is about understanding agricultural processes, specifically with relevance to the particular field they find themselves in.

(sometimes under a tenth of an acre) to grow paddy as well, as no other crops grow submerged in water. Some of these small parcels were leveled by a tractor which created great compaction given the small area to turn the machine around on. Immediately adjacent to fields worked by tractor, oxen performed the same job. Rice was grown continuously on these fields and became the only crop people knew how to grow. Beyond lack of knowledge of different crops, farmers were influenced to modernize as social status was important there. I was told that tractors were increasingly prevalent in the village despite the permanent damage of soil compaction caused by them. As I inquired, no one seemed to acknowledge soil compaction as a reality. When I asked what is hindering the ecological movement, Babu, a 48-year-old-farmer from Mulugu who noticed the changed in people's attitudes as green-revolution technology was adopted answered: "People think that farming is like a machine; the more [chemicals] they put into the machine then the more will come out. They treat land and nature like a machine. Nobody is telling or educating about the organic techniques." Several times during my research, I heard stories of farmers applying more than their neighbours' as if more were always better. CSA field staff Adinarayana shares his story:

I've witnessed this myself. Once, at a women-self-help group, a farmer came up and asked for 2000 rupees to buy fertilizer. The following week, her neighbor came and asked for 2,500 rupees. There is a pride that a farmer can afford these chemicals...they apply with pride, not knowledge.

There has developed a certain theoretical hegemony in regards to the current agricultural paradigm that is valued higher than previous practices and worldviews. Indigenous knowledge is being completely replaced by approaches offered by the market rather than developing them with current ecological science. Kumbamu makes the assertion that "From a neoliberal modernization point of view, any skill set of a farmer or a worker that hinders the expansion of the market is obsolete and must be destroyed" (2007:891). A progressive, modern farmer in India typically adopts these new technologies. In response to traditional techniques and worldviews being regarded as obsolete, Babu pointed out that "for 50 years they have been coming to tell us how to farm as if we have not been farming since the dawn of civilization". The ecological reform goes beyond plainly trying to satisfy the market's needs with off the shelf solutions, it is a paradigm whose basis begins with knowledge of the local environment. Farmers present on their lands are then best suited to this ideology. Broadly, the ecological approach requires adoption of suitable seed, pest, nutrient, soil and water management technologies and practices that are specific to a given farming system. The practice is not simplified and standardized, rather, it finds strength in complexity and diversity.

The clash between an ecological worldview and the conventional was elucidated when I accompanied Suresh, a rural development officer, on field visits. He was interested in ecological agriculture but not yet convinced. This was an interesting opportunity because he, having been trained in traditional agricultural science, was taught that organic agriculture is impossible. He questioned the farmers we visited with great skepticism; his initial reaction was disbelief. When setting sight on a cotton field, Suresh said: "These plants are not healthy. I am counting 20 ears of cotton per plant. A healthy plant can have anywhere between 30 and 50 ears". His assessment was done solely on yield; Boddu, the 48-year-old farmer present was quick to justify his production practices:

But don't you see, this crop cost me practically nothing apart from my labour. Also, we are experiencing a drought at the moment: everyone is lacking water. While some neighbouring villagers may be getting higher yields, when we compare profit at the end of the season, I come out on top. I have been debt free for many years, this is not the case of everyone around here.

Boddu went on to show some of his other plots. His vegetable gardens were a series of 5-15 square meter blocks which Suresh thought were for sustenance and not profitable for market. But Boddu had a justification once again: "I take these vegetables to market in the village once a week, and already there are people waiting for me. Because they know my vegetables taste better than the others. I know this is because of organic, but customers just buy because of taste. I charge a good price and regularly sell out". This is a pragmatic starting point to understand the ecological argument. The development officer approached the situation in the current agricultural paradigm, which has focused on increasing yields, rather than looking at the health of the soil, surrounding environment and well-being of the farmer. In response to the risk of crop losses due to virulent pests, drought or untimely rains, Peddanna, a 71-year-old organic farmer said: "Yes, crop failures do happen. But my investments are low [with organic farming], I do not lose as much now as when I had invested all that money into pesticides and fertilizer. The risk is less; my mind is in a better state."

The implications that an ecological appreciation can have for farming systems can be startling for those accustomed to the monoculture field crop approach of modern agriculture. A visit to Nagrathneam Naidu's farm was the epitome of the potential of understanding natural agricultural cycles and promoting them.

An educated farmer who wants to make the agrarian profession proud by actively promoting the success of his organic management, Nagrathneam has become a spokesperson for the ecological movement where scientists, government officials and thousands of visitors have been welcomed to his farm to see the potential of ecological agriculture. His cultivation techniques are so effective that he received a letter of honour from the prestigious International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) for a record yield of 95-110 Kg pods from two Kg of their seed in organic peanut cultivation trials and once held the national record for highest yield per acre of rice. His farm is an excellent example of how an ecological practice does not imply a loss of yields. Use of innovative systems like the system of rice intensification (SRI)² and holistic soil nutrient management³ are some of the techniques he is trying to propel.

² The system of rice intensification (or more appropriately, system of root intensification) is a production method in which rice seedlings are singly transplanted at a wider spacing than traditional rice plantations. Traditionally, rice seedlings are planted in much higher density of bunches. Instead of flooding fields as is done in traditional rice plantations, SRI uses hand weeding and weeding tools to control weeds. The system claims to increase yields, save water, reduce production costs, and increase income to practicing farmers.

³ Holistic soil nutrient management is a framework that recognizes the necessity of soil microbial health, its contribution to the building of soil organic matter and ability to render bound nutrients available through microorganisms rather than performing soil tests based on available nutrients and supplementing fertilizer to attain the crop demand. This management system recognizes the

Arriving at his farm, I saw a surrounding landscape typical of the region; dry and barren with little vegetation. Entering his farm was like coming into a microclimate to the juxtaposing surroundings. He had planted many trees, as these brought up nutrients from the subsoil that would be reincorporated to the soil through the decomposition of fallen leaves. Outside of the tree canopy, it was hot, sunny and dry. Under the tree canopy, it was much cooler, the soil was laden with earthworm castings, many plants were found growing together and there was a significant amount of insects around. The essence of his cropping pattern was summarized when he stated: “Instead of looking at the segregation of plants, look to integrate them...one plant can have many purposes, without knowing their potential, we are working against nature”.

Today, the 12-acre farm is divided between a seven-acre mix of gardens and orchards and five acres of field crops. Naidu grows 15 or more different vegetables, 15 different fruits (not including the 25 varieties of mangoes), 10 types of pulses, three spices, 35 varieties of flowers, 10 medicinal plants, and over five different types of wood, all with organic techniques. He intercropped plants where he could: mango trees in papaya plantation, successive crops between establishing fruit trees, wood trees delineating fields, and a forest cultivation⁴ system had many species growing together: banana, coffee, coconut and ornamental flowers where room was left.

When I inquired into his pest management, Naidu answered that he did “Nothing, nature takes care of itself”. The idea that severe pest outbreaks are a symptom of a misbalance in nature is central to ecological agriculture. Naidu explains how the accumulated biodiversity on his farm inherently controls pest outbreaks:

Nature will balance. You see in nature there are both vegetarian insects and non-vegetarian insects. The bugs that eat my crops are food for other insects. 90 per cent of disease gets dealt like that. We can make efforts to reduce the remaining loss, such as removing diseased plants and burning them or intercropping, but ultimately you cannot eradicate all pests or disease. Some loss will always be there. If I irradiate all pests from my field, then there is a possibility for another insect to colonize and become a pest... Can't you see all the butterflies, dragonflies and birds all flying around my farm? This is my proof that my methods are effective. This is my organic certification.

A case like Naidu's encapsulates an individual successfully scaling up the ecological approach. The recognition of his efforts on national and international levels and his willingness to share his practices provides him with significant influence on thousands of farmers and consumers. With Naidu's farm, there is a physical example of ecological farming's potential and the necessity for biodiversity in order to attain such success.

Mobilizing the framework that Naidu implements is a great challenge for various movements working in the ecological sector. Given that modern agricultural development has focused on a high input and market driven approach, on a social level, adopting Naidu's

importance of applying organic matter in various forms: manure, urine, fermented preparations, compost or other farm-based preparations.

⁴ Forest cultivation systems, colloquially known as forest gardens, intercrop several levels of canopy (ground plants, shrubs, trees) to maximize production space and symbiotic relationships between plants. Diversity and heterogeneity make the system unfit for mechanization or commodity production, which may account for the general unfamiliarity of the system to agriculturalists.

solutions, such as the use of animal manures and local seed systems, is seen as reverting backwards to inferior times. Partha, a 41-year-old natural farmer from Anantapur spoke of a great fallacy in conventional farm management:

Where did this idea of 'agricultural waste' come from? People are burning their crop residues, throwing away cow dung. People do not value these things so much anymore. The soil not only has the ability to recycle these, the [soil] microbes need these like food... When we see the value in these leftover organic materials and how they are fundamental to natural soil processes, then only can we proceed to farm [ecologically].

While a complete transition to a farm system like Naidu's may be near impossible to many small and marginal farmers due to lack of resources, his farm demonstrates the potential of promoting ecological processes. It is a given that to those interested in adopting some principles from Naidu's system need a conversion time: soils need to be remediated, perennial plants take time to establish and slowly will the established biodiversity attract a healthy population of fauna. As such, the transition to the ecological paradigm can only be done in increments.

Incremental Approach

Having recognized the aggravating situation of the current agricultural development agenda and having been introduced to ecological principles, the scaling-up of ecological initiatives at the village level can only proceed by an incremental approach.

The soils of India are considered fragile as compared to the soils of the temperate world, having average organic matter contents of 0.1-0.5 per cent as compared to 5-8 per cent in the north. Alongside the implementation of synthetic fertilisers has been the gradual phasing out of animal manures and composts in fertility management. Many people, such as Marappa, a 53-year-old farmer from Mudimala, spoke of the staggering in yields attained of recent as opposed to earlier years of chemical farming: "But then the soils got sick. Yields were decreasing even when we added more chemicals." The soils of India were quite peculiar to me. Having such low organic matter, the soil did not hold together as a clump if you held some in your hand. A common practice that I observed was mounding brassica plants so that they would not fall over as they grew in size, a practice that was alien to me with my experience farming in temperate climate. When I visited the Kurnool District, Janardhan an extension specialist, would point out fields that had been degraded by overuse of chemicals. He needed not to point them out, one could clearly see the low growth rate in these degraded fields.

The soils which have been cultivated solely with chemical fertilizer have been degraded of organic matter, which is the basis of the farmer's diagnosis of the sickening of the soils. The remediation involves a series of growing seasons under ecological management which would increase soil organic matter and biology thus healing the soil or making it fertile again. Understanding soils as a living organism that can become "sick" is not shared by conventional agriculture who treats the soil more so like a bank account, in which any nutrient would merely be deficient. Achieving soil health then does not happen overnight or with a single application of fertilizer. Partha from Anantapur admitted:

Transitioning [to organics] is hard. Losses of yield are there in the first two-three years, but the soil ameliorates. To avoid large losses, we recommend people to transition only a portion

of their land at first. This gives the opportunity for farmers to also start noticing differences in soil health.

This incremental approach is used not only to secure livelihoods during fertility transition, it is also used to convince people who are skeptical about using locally plant based pesticides. Somakeshamma, a 42-year-old woman farmer from Rangapuram tell us how Janardhan convinced her to convert to farm based pesticides:

In a piece of farmland, we were told to spray neem oil covering half of the land and another half with the regular chemical pesticide. I noticed the difference and efficiency complemented with the lower purchase price of neem oil and was convinced...I gave it time and practical application before adopting it, but now I know neem oil can be sprayed on literally anything.

Somakeshamma reported having to obtain the neem oil from 200 km away. Ironically, this was mentioned while we sat under a neem tree. It appeared that when individuals began using these techniques in a village that was not, the workload of collecting and grinding local seed deterred people from doing it on-farm and instead chose market made neem oil. This created spacial disparities in terms of the cost of such techniques. The fact that there were no processing facilities near to the village meant that neem oil had to be brought in from the nearest processing facility, 200 km away. Shipping raised costs for organic farmers, and acted as a deterrent to ecological agriculture in the area. In contrast to this, cultivators in Pamidi, Anantapur were able to get neem powder cheaply and easily with the help of the Rural and Environmental Development Agency (REDS), which had a neem pulveriser on site.

According to Av Singh (2012), industrial agriculture has focussed on a 'one big hammer' approach to deal with pests and weeds, the chemical approach. As it was stressed to in the previous section, ecological growers choose a more pluralistic approach, employing several timely techniques, or rather, 'many small hammers'. While the multitude approach has sound economical and environmental benefits, many techniques as opposed to one is an inherently more complicated approach which takes training and adjustment time. Zoya, a 38-year-old villager outside of Visakhapatnam, tells us her experience adopting non-pesticide management:

We have had success applying neem extract. At first it sounded like a lot of work but we organized ourselves and came together as a community to grind the seeds and make the extract, that was a building experience... But sometimes we are recommended concoctions that ask for five or six different types of plants. I have not understood why these plants are needed or found time to gather them all and make that preparation. I still question those more complicated farm-based pesticides.

At a few instances I had the opportunity to see how farmers create some of the concoctions spoken about above. Many on-farm pesticides are made with cow urine or dung. Indian homes are generally simple and small. The preparation of these farm-based pesticides is hindered by the few resources available: farmers must handle the animal urine and faeces by hand (something that conventional growers laugh at organic farmers for), few, small pots mean continuously transferring batches to plastic containers and the lack of tables or workspace hinders the streamlining of making these products The result is a difficult, dirty and time consuming affair. Farmer must then be dedicated to creating these concoctions or systems have to be developed to make the creation easier and quicker. In

some villages, landless workers make these preparations for farmers and sell them locally to earn some income, though this was not observed widely.

While ecological extension officers can help introduce new agricultural strategies, the above insight demonstrates that farmers themselves must take over practices and make them their own. A premise of ecological agriculture is that local knowledge creates local solutions. However, with the current agricultural paradigm, innovation largely happens in laboratories and universities, often funded by profit-interested companies. Encouraging farmers to develop suitable methods and tailor them for their unique system is to promote them as innovators once again, something which has been discouraged in the past century. Discussing with Satheesh from the Deccan Development Society (DDS), an organization that makes a firm point of opposing the elitist detachment of agricultural science over farmers:

All farmers are dubbed as stupid; if you are a progressive farmer, you start using chemicals and crops that can be sold in the market. In research, we keep quoting each other, other scientists. But not other people. If I write a paper, I will quote another scientist. Not a farmer. But we all learn from farmers. It is their knowledge that has sustained agriculture...in a country that is over 5,000 years old.

The extension officers of the DDS, much like those of other ecological organizations, then become relaters of best practices and social engineers in their region of work as opposed to bearers of developmental truth. There is certainly a requirement of knowledge development that must be on-going, use of platforms such as farmer field schools integrate farmers as innovation generators to realize the local knowledge based solutions of ecological agriculture. In any innovation, there is a period of refinement that is required for scaling-up, likewise, ecological practitioners cannot succeed with alternative techniques until they experiment and develop what works for them.

Assembling organic growers under cooperatives was widely accepted by the ecological sector as a way to increase the well-being of cultivators. Indeed, it offers a platform to exchange information, share resources and ultimately, command a better price for their organic produce. Sometimes, promises of better market prices for producers became the sole incentive to adopt ecological farming practices. Adinarayana, an extension officer who invited me to Kadiri, his area of work, mentioned: "Here we have done a lot of work with a mango cooperative. Farmers are very enthusiastic to our [ecological] ideas for this crop and they have begun to use insect traps and natural pesticides. However, for all the other crops, we have a long way to go, people seem only interested in growing organic if we can secure a market for them."

Beyond this approach catering to cash crops and not the entirety of production that a farm can have, current markets have a carrying capacity and often the total yield of a village exceeds what the market can handle. The Centre for Sustainable Agriculture who has been very successful at establishing cooperatives, where over 2,000 farmers sell through the farmer producer company Sahaja Aharam, admitted that: "Total value for just organic produce is 700 million rupees. That is the volume of produce [the affiliated farmers] are producing. But today we are able to sell about 10 million rupees."

Growing ecologically is more labour intensive than off the self solutions. It could be disastrous for the ecological movement if a village is convinced by better markets to invest

their labour into ecological production if the prices cannot be realized. Saddaradhi, a 42-year-old extension officer from Anantapur mentioned: “When the big harvest comes and prices crash, people just throw ripe tomatoes and ripe papayas in the roads, maybe as a sign of protest.” As I visited Krishanti’s organic farm in Jepthisingaipalli, this was a reality. She did not make an attempt to harvest her papaya plantation; fruit rotted everywhere. At one acre in size, it was too large of an amount to sell locally but too small to be brought to the nearest city, Hyderabad, some two and a half hours away. She urged neighbouring farmers to adopt organic farming practices and form a cooperative to be able to reach Hyderabad market. Outside agencies who are then working at transitioning villages to organic practices must be wary of making promises that cannot be fulfilled which could make farmers revert from ecological practices. While the organic sector is growing in India, with estimates ranging from 25 per cent to 100-300 per cent yearly, it remains today a small niche market (Oswald and Menon, 2013). Notably, however, as of 2014, 54 per cent of the world lives in urban centres (WHO, 2016); this urbanization trend is also happening in India. The development of organic markets is then an important task for agencies in the ecological agricultural sector.

The ecological movement is a transition that needs to be done at several levels; improving of soil health, adoption of several labour intensive techniques and establishing new markets. These transitions require time and it was observed that they are more likely to be maintained if a solidarity is created towards a belief in ecological farming.

Solidarity

To achieve a solidarity towards ecological practices is to distinguish it as a separate paradigm than conventional approaches. As discussed below, this is important to give a voice for practitioners who are often suppressed by skeptics, but also mobilizing successful frameworks of the ecological movements requires proper institutions, for instance, locally based seed systems.

People here are laughing at the [ecological] practices using all these things. They are thinking we are mad. Now having seen all the results, they are convinced, moving forward to doing the organic method.

Venkat prepared a decoction consisting of marigolds (*Tagetes spp.*), *Melaleuca* and cow urine intended to control mites in peppers as he mentioned the above. With an austere recipe that required the concoction to be boiled and cooled three times before application, the village’s disbelief and mocking of him is not surprising. His successful results raised some interest as two villagers were also present along myself to learn these techniques, but the acceptance was still slow. Farmers then need support and affirmation that these methods are viable. The ecological movement requires a voice to inspire farmers to defy the status-quo. One such orator, Prakash Singh Raguvanshi, a plant breeder from the Varanasi area, has made this a life purpose. While attending a training on participatory seed selection and development, his oration was evident as all would become silenced as he spoke:

Farmers! Arise and awaken others around you. Learn to produce your own manure and seed. Learn and teach among yourselves! If you want to save the farmers and if you want to save the country then only use cow products, your own seed and other organic methods to farm. If you use local, country origin manure and natural pesticides with microbes, then health and prosperity can be insured!

Raghuvanshi uses catchy slogans to get his message across to the farmers such as “Apnikheti apnikhad, apnabeeja apnaswad” (one’s own farming, one’s own fertilizer) and “Beejabachao, deshbachao” (Save seed, save the nation). The voice that must be generated for ecological agriculture goes beyond assuring that manure and local seed are viable alternatives, it must encompass social stigmas that have deeply been engraved in the choice of crops one can grow.

In ecological agriculture, choosing crops appropriate to the growing location is integral to minimizing high inputs. Though for several decades, the minimum support price that has accompanied rice and wheat has made them staple crops that farmers can rely on for assured income. These crops have also been promoted as progressive crops for the modern farmer. Choosing alternative crops, such as millets, is seen as a poor man’s crop and hinders a farmer’s choice to grow a multitude of crops. David Bergvinson, the director general of ICRISAT explains:

Millets, sorghum, pigeon pea, chick pea. These are the traditional crops in semi arid regions. In the current perception, farmers see cash crops like rice or sugar cane as a rich man’s crop to grow and consume. This must be turned around. Farmers are currently tied to a single market, they have to go to a single crop to realize their opportunity, as the generous subsidies offered by government to grow rice or wheat. We are trying to change the perception of these crops because they are good for people as they are highly nutritious and good for the planet as they need less water.

The efforts explained above are shared by many organizations working in ecological agriculture. The Deccan Development Society has long been promoting millets due to their health content and low water or nutrient requirements and have gone as far as opening up a restaurant serving only millets to demonstrate that many staple meals can be prepared with millets as opposed to rice. Overcoming social stigmas and being capable of growing crops that secure both weather and market risks then becomes an issue at the level of society. Apart from social acceptance, farmers also need cooperation to succeed in these crops. Zoya, a transitioning farmer from Visakhapatnam tell us her experience:

We tried millets last year, but the birds ate a lot of our crop. If the whole village would changeover some of their fields to millets, then losses from birds would be distributed and we could still get a yield. But for now we will not grow millets again unless more people around us attempt it, too.

The small landholdings in Zoya’s village are typical of the Indian scenario. Small plots often under an acre but seldom exceeding two create a village-like landscape in fields. Raja, the extension officer of the area, explained to me the obstacles of implementing new crops to the region:

Years ago, only wheat and rice grew here. And the yields were going down because of deteriorated soils. As people began to apply manure once again, they found it possible to grow other crops that were not possible before, such as black gram... [But] millets are just seen as a poor person’s crop. Progressive farmers want to do wheat or rice.

Zoya being the sole cultivator of millets in her village led to large losses by birds. Only by getting beyond the negative social stigma of millets as a poor person’s crop and recognizing the added biodiversity and health benefits of more complicated cropping systems will millets succeed in this region.

The cropping patterns which have been promoted by conventional agriculture then restrict ecological agriculture. Overcoming these restrictions requires village and institutional level support. The same support that is required to develop locally based seed systems.

Good, locally adapted seed is crucial for successful agricultural systems. The introduction of High-Yielding Varieties (or more appropriately, high fertilizer responsive varieties) has disrupted locally based farm systems because farmers have become consumers of seed from the market as opposed to on-farm breeders and these superior varieties require high input that not all soils can provide.

“With conventional varieties, yields were poor. If I apply synthetic fertilizer, I have to water four to five times, because otherwise it burns the soil. When I adopted superior local varieties, yields were good. Yields came with only dung”. The above farmer, Balakrishna from Khammam, speaks of his experience adopting a local open pollinated variety of wheat bred by Prakash Singh Raguvanshi. Raguvanshi has been successful at developing high-yielding, low input seed because his breeding regime constituted such an environment. His breeding efforts have been so successful that trials were conducted in association with the Centre for Sustainable Agriculture and confirmed that his Vishwanathan variety was better than the wheat in Maharashtra. He stated: “When our native varieties are giving more yield. Then why do we need these foreign seeds?”

Visiting his research station during a training on participatory seed breeding was an interesting insight because of his acclaimed success and reputation despite how simple and low-tech his farm was. Many scientists were astonished of his breeding successes despite having no laboratory, modern technology or outside funding. His breeding strategy involves the classical selection approach where seed from an outperforming plant is selected and multiplied. Only a continuous effort and a keen eye are required to be a successful breeder according to Raguvanshi, he states: “With determination and hard work, one can achieve anything”. With modern market bought seed, farmers are discouraged to do any on farm selection. It was strange to me that some farmers had travelled great distances for this workshop given how simple the subject matter was. Though given that few farmers perform on-farm breeding today, the skill has at large become lost, justifying the need to relate such knowledge. After five or six seasons of selection on his farm, Raguvanshi freely gives away seed to anyone instructing them to plant the seed and to give some of the harvest away so that other farmers can have access to the seed. “This is participatory in nature. If the farmers say that the variety is not nice then it is rejected but if they like it, it spreads like fire”. As a recognition of this humanitarian work, Raguvanshi has received funding from The National Innovation Fund which has made it possible for him to start a seed company, Kudrat Seeds.

While Raguvanshi’s example is a success story of hard work and luck, the development of good varieties at the village level proves to be a problem. The Director General of ICRISAT said: “In the case of open-pollinated varieties, farmers can recycle their seed, but over time the genetics deteriorate. You need to refresh with new genetics. Proper on farm selection is a challenge we have not been able to scale up.” Adinarayana, the extension officer from Anantapur elaborated: “Yes farmers recycle seed here, but they do not do much selection. They just take a handful of seed and disperse that to the village.”

In order to assure good selection practices, the Centre for Sustainable Agriculture appoints a Seed Grower Association to the seed banks which they establish in various

villages. This association is meant to assure good production practices, but field officers still offer assistance to ensure selection is happening appropriately. Continuous breeding efforts are imperative for viable agricultural systems. Bringing breeding efforts back down to the farm level requires a village level appreciation of the necessity of proper techniques which is ultimately a shared trust or solidarity amongst the village.

With the above field experiences, we get a glimpse that the realization of ecological transition requires the appropriate knowledge, incremental adoption of practices and ultimately a solidarity and trust towards the alternative techniques. The essence of this study is that adopting ecological practices is not solely changing inputs but involves a change in worldview. The adoption of this new paradigm is discussed next.

DISCUSSION

The above proposed model of ecological agriculture adoption is in line with Kuhn's paradigm shift (1962) suggested in his seminal work, 'The Structure of Scientific Revolutions'. Kuhn argued that application of the scientific method does not lead to linear increases in knowledge but to shifts in worldview. As Kuhn describes, "Paradigms gain their status because they are more successful than their competitors at solving a few problems that the group of practitioners has come to recognize as acute" (1962:35). The degradation of soils, biodiversity and groundwater from the widespread implementation of Green Revolution technologies are crises that require adoption of alternate agricultural practices. Noteworthy is that the development introduced during the Green Revolution did not solely include introduction of new seeds (Patel, 2013). Policy reform, mechanization and irrigation are important components of conventional agriculture. Likewise, depending on this development to feed growing populations entails intensifying these approaches; increased water use, questionable technologies (such as genetically modified organisms) and further land consolidation practices including reformations and notorious land grabbing. This has long been proposed, dating back to Cochrane's agricultural treadmill concept (1958). As observed in part I, the mode of action of the CSA differs from mainstream science; "The assimilation of either a new sort of phenomenon or a new scientific theory must demand the rejection of an older paradigm" (1962:107). The ecological age could be the new paradigm that Kuhn announces. A scientific revolution that results in paradigm change is then analogous to a political revolution. Mobilizing ecology as the standard lens to study and manage farming systems is a lengthy process. Practitioners, having spent entire careers in conventional agriculture, have lifelong vested interests in maintaining their work as correct. The scientific revolution of an ecological age is humbling in comparison to the positivism and certainty that western science adopted during the Enlightenment:

The premise of human domination over nature leads to a false sense of control, and, in turn, social organization of technology around this false sense of control increases the inflexibility of our response to ecological degradation (Harries-Jones, 1995:8).

The heavy reliance on few modern agricultural solutions was elucidated when Indian farmers reported being told to increase chemical application to overcome pest or yield issues. Higher application rates harm the ecosystem and increase likelihood of debt. Such is the typical crisis driving the ecological revolution. The crisis' basis is a certainty in modern agricultural methods that has put human made technology over ecological principles, creating the false sense of control Harries-Jones notes above. The solutions sought to get out of the chemical trap lay outside of the modern paradigm because they are based in a different science.

Spreading this new worldview is done on the sound scientific relation of successful stories and clear methods.

To effectively convey the ground realities of the agrarian situation in India (or anywhere) and to explain how villages are overcoming their struggles, a multitude of mediums, including narratives, documentaries, reports and case studies is essential. The importance of biodiversity for the ecosystem's stability is widely recognized. Likewise, it could be professed that a diversity of methods and sciences is the appropriate way to move forth human thought. Qualitative research is often regarded as less credible than quantitative. Repressing qualitative research is likewise repressing the whole of science:

Qualitative research as understood in other social sciences is virtually non-existent in the American Journal of Agricultural Economics. This tendency has given rise to the question of whether research methods are chosen as a function of the problem addressed, or whether the problem is chosen as a function of the techniques available (Bitsch, 2005:75).

The theoretical hegemony that is held by today's popular science then hinders other forms of thought/research and illustrates the challenges when new sciences, such as agroecology, emerge.

In this research I chose to examine the stepwise progression that villages go through to learn and trust ecological agriculture; I then chose appropriate methods to study something as elusive as trust. Trust in the capacity of ecological agriculture is imperative to its mobilization, as Carolan (2006:334) explains "We often find truth in those social relations we trust." Accepting a knowledge claim is closely linked to our beliefs and social circles:

On the one hand, terms such as "radicals", "hippies", and "old-fashioned, small-time farmers" were used by proponents of conventional agriculture to weaken the authority of those associated with sustainable agriculture. Likewise, similar tactics were used by proponents of sustainable agriculture (when spoken of more conventional operators), who used such terms as "greedy", "materialistic", "selfish", and "closed minded". Again, the goal of such discursive acts was to weaken the authority of opposing actors (and networks) in an attempt to make them appear untrustworthy and thus untruth worthy. (Carolan, 2006:331)

Such an insight questions whether ultimate objectivity, which is stressed by dominating sciences, can be attained. The ecological revolution in accordance with system thinking recognizes multiple views (and thus realities) towards the observed. Empowering farmers by educating them in ecological principles results in practices that are not standardized across India, rather, location specific. This is a reversal and necessity of current agricultural development: bringing innovation back down to the farmer and re-skilling them to take charge of their farming systems as opposed to consumers of the market.

EXTENDING THE RESEARCH

This study was my first visit to India and to sustenance agriculture for myself. With the above insights I gained into the adoption of ecological alternatives, I identified several topics which could be of use to those in the ecological agricultural sector.

Cooperatives

Cooperatives as a vehicle to exchange information and command better market prices was often regarded as a panacea to increase livelihoods in rural India. It was noticed during my research that not all cooperatives are formed with ease or successfully formed.

Many remained stagnant, whereby a cooperative was formed, but little came out of the association. A further study on successful models of cooperative implementation would be of use to the numerous rural development organizations that work in India. Specific inquiries include how to create a structure where the practicing farmers command a voice in the cooperative, how to prevent the board of directors to claim large profits from the farmers, the creation of village level banks for community loans and investigating cases that have successfully built collective infrastructure, such as cold storage units.

Rainwater Management

Water is perhaps the most limiting resource in India, in Telangana, where this study was mostly conducted, the state is entering its third consecutive year of drought. The lack of water was continuously spoken of: “If I have water, I can do miracles”, mentioned Naidu.

There are simple and low cost rainwater harvesting methods that exist though are not widespread in India. The technique involves mapping the slope of a field and digging shallow ditches according to it as to catch the rainwater and have it absorbed by the soil which replenishes the aquifer. Documenting successful villages that have replenished their groundwater levels through these methods, including the establishment of social norms on ground water usage, would be of interest in these times of water shortages.

The Governmental Shift

While the development agenda of the government of India has heavily leaned towards high input technologies for the past few decades, there is a shift that is occurring. The Andhra Pradesh Government aims to train 150,000 farmers in organic farming over the next three years to “Eliminate consumption of chemical fertilizers and pesticides and also to promote natural manures like cow dung in farming. The prime concept of this project is to reduce expenditure in agriculture and to raise the income for the farmers” (The Economic Times, 2016). Alongside this initiative, the same state has begun training Multi-Purpose-Extension-Officers whose mission statement includes implementing many new approaches to farmer development such as farmer field schools, market diversification and use of local resources. Paramparagat Krishi Vikas Yojana (PKVY) is another scheme that was launched in 2015 to encourage organic farming. Farmers that organize in clusters of 50 or more working at least 50 acres will be provided 20,000 Indian Rupees (INR) per acre spread over three years. 4.12 billion INR have been put aside in the 2016-17 budget to implement PKVY.

The organic market remains an elitist one, often for export. Examining the efficacy of these systems on whether the organic methods are increasing livelihoods and reducing suicides could be a cardinal study to further propel the ecological paradigm.

CONCLUSION

The condition of many small and marginal Indian farmers, of low or no profit margins leading to debt, poverty and in extreme cases, suicide, depicts the agrarian crisis occurring today. In the Indian context, remnants of colonialism are still very much apparent and extend much beyond industry. The authors of the World Development Report 1998/99 state: “Poor countries – and poor people – differ from rich ones not only because they have less capital but because they have less knowledge. Knowledge is often costly to create, and that is why much of it is created in industrial countries” (World Bank, 1999:1).

Elizabeth Bird goes on to describe the consequence of such idea:

First, that these development planners know what 'the people' in the 'developing countries' want; second, that what they want is what 'we' have; third, that 'they' are not yet advanced enough to be able to fully indulge themselves with repercussions; and fourth, that discipline, prudence and forbearance are some of the qualities necessary to success (quoted in Escobar, 1995:159).

The above insights in regard to the theoretical hegemony held by the West illustrate the challenges that the mobilization of the local knowledge of agroecology will face given that it does not adhere to global markets but local needs. It has become difficult for us to imagine a society in which the market does not play a central role; a market economy. It is easy to forget that it is only in the past 100 years that it has taken a central role, no society, ever, has been managed in such a way (Polanyi, 1944). The consequences of such a system are becoming increasingly apparent: in a market economy, the market does not conform to societal norms, but society must conform to the market's demands.

Without conducting a societal transformation at-large, the Centre for Sustainable Agriculture has offered solutions that provides employment to its own staff while improving the livelihoods of farmers, promoting environmental services and healthy food to urbanites. They are actively working towards the decommodification of food and seed, to a place where taste, trust and value prevail over the rupee. Their work demonstrates that a fair agriculture, which alleviates hunger and improves livelihoods, is possible through the implementation of sound agroecological principles.

This thesis contributes to the accumulated documentation of the process of adopting ecological agriculture in India. The two guiding questions along the study were "How is ecological agriculture materialized on the ground in India?" and "How are traditional smallholder peasant farmers accepting ecological farming practices?" Largely, ecological agriculture was observed to refute market-made products while reverting to farm-based solution with appropriate solutions, such as village level seed banks and shorter marketing streams. In my research, I saw the on-going crisis to be a driver of an agrarian and political revolution towards an ecological age. It is a shift at various levels of the agri-value change but also a shift between the relationship of extension officer and farmer. Given that the scientific groundings of the ecological movement are more akin to the interconnectedness of quantum physics than the separation of Newton, the move towards an ecological age is a shift in worldview to study food and farming systems.

For the successful mobilization of ecological agriculture, I observed during the study that villages need to experience the capacity of the production system themselves and adapt it to their own farms. Specialized extension officers, such as agroecologists, possess the skills to empower farmers with ecological knowledge and collaborative learning platforms such as farmer field schools. The gain in trust in ecological agriculture is heavily aided by these extension specialists because of the lack of knowledge observed. Organizations then working in the field must relate their work to higher levels of government so that further assistance can be brought to the movement.

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APPENDICES

Appendix 1 - Sample Interview Page

OPENING QUESTIONS

Please share with me, in greatest detail possible, the operation of your farm, what do you grow, where do you sell, is there any outside income?

What are the differences between your farm now and your farm (or farming) when you were a kid?

What are the things that work well for you? What is not working?

TECHNOLOGICAL/KNOWLEDGE

What is your opinion about modern agricultural technology as compared to traditional methods?

What technology or methods have you adopted? Good or bad.

Tell me about seed, what do you think about local varieties as compared to newer varieties?

What information, skills or technology do you need that is most difficult to find?

INSTITUTIONAL

Where do you get agricultural information, and from who? Has this changed overtime?

Tell me about your relationship with the CSA. How has your trust with them evolved? What aspect of their work do you question or believe in?

Tell me a successful learning or practice implementation that you got from CSA. What did you like and what did you not like of their operation?

What is your relationship with other agricultural advisors? What does it take for you to trust in or simply access them?

ECONOMICAL

Is farming a financially viable operation for you?

What does it cost you to adopt ecological farming practices?

Would you sacrifice yields for lower input costs?

What is preventing you from producing more of your own inputs? (Such as seed, vermicomposting, neem cakes)

POLITICAL

What is the government doing to help small and marginal farmers?

How have farm subsidies affected you?

SOCIO-CULTURAL

How do your neighbours regard organic farming?

Are you part of a co-op? If so, how has your situation changed, if not, why not?

What has motivated you to adopt (or reject) ecological farming practices?

How does a farmer gain trust or hope in ecological farming practices?

Do you feel like you have been lied to regarding the promises of chemical agriculture? How do you decipher good information from lies today?

Some organic growers are laughed at for their practices. How are communities slowly accepting these practices?

ECOLOGICAL

How do people feel about environmental health?

What are farmers doing to rejuvenate surrounding ecosystems? Do they have the time or money to improve it?

Who is playing a role in this? Are farmers left alone?

CLOSING

What do you foresee the future of your farm to be? Will your children be taking up the farm?

In conclusion, what would be the greatest change or factor that would increase your livelihood?

Appendix 2 - Interviewee Details

Table II – Interviewee Information				
For the sake of anonymity, all names have been changed				
Nickname	Gender	Age	Occupation	Location
Ramoo	Male	48	Director, CSA	Secunderabad, Telangana
Ali	Male	49	Organic Farmer	Manikyapuram, Telangana
Raju	Male	62	Organic Farmer, Cooperative leader	Enabavi
Kalyani	Female	34	Organic Farmer	Enabavi

Babu	Male	48	Organic Farmer	Mulugu
Boddu	Male	41	Organic Farmer	Kshera Sagar
Krishanti	Female	44	Organic Farmer	Jepthisingaipalli
Marappa	Male	53	Organic Farmer	Mudimala
Dr P.V. Satheesh	Male	65	Director, DDS	Paspatur
Raj	Male	35	Extension Staff, DDS	Hyderabad
Saresh	Male	35	Rural development officer	New Delhi
Joyson	Male	39	Cosmos Green Retails Operation	Hyderabad
Cosmos Green Accountant	Male	45	Cosmos Green Accountant	Hyderabad
Prakash Singh Raghuvanshi	Male	59	Seed Breeder	Tandiya Village, near Varanasi
N. Naidu	Male	63	Organic Farmer	Taramathipeta
Janardhan	Male	37	Extension Officer, CSA	Kurnool District
Somakeshamma	Female	42	Organic Farmer	Ranga Puram, Kurnool district
Peddanna	Male	71	Organic Farmer	Kondapuram, Kurnool district
Narasirnha	Female	38	Organic Farmer	Kondapuram, Kurnool district
Venkat	Male	44	Organic seed and grain producer	Kondapuram, Kurnool district
Adinarayana	Male	42	CSA Extension Staff	Kadiri
Headmaster	Male	55	Organic Farmer	Kadiri
Narsanna	Male	56	Aranya Agriculture	Hyderabad

			Alternatives Director	
Sergoo	Male	42	Conventional Chicken Farmer	Baran, Rajasthan
Sunil	Male	39	Conventional Grain Farmer	Baran, Rajasthan
Balakrishna	Male	41	Organic farmer	Khammam
Aayush	Male	39	CSA Extension Staff	Hyderabad
Raja	Male	33	CSA Extension Staff	Visakhapatnam
Zoya	Female	38	Transitioning Farmer	Visakhapatnam
Nirmal	Male	45	Organic Farmer	Visakhapatnam
Misti	Female	44	Organic Farmer	Visakhapatnam
Achintya	Male	38	Transitioning Farmer	Durgapur
Jitha and Don	Male and Female	35, 36	Organic Farmers	Birbhum, West Bengal
Partha	Male	41	Organic Farmer and cooperative initiator	Anantapur
Sunnivila	Female	68	Organic Farmer	Anantapur
Saddaradhi	Male	42	Agricultural Scientist	Anantapur
Giri Babba	Male	39	Organic Farmer	Anantapur
Uttara	Female	29	Navdanya staff	Ramgarh, Shishambara
David Bergvinson	Male	UK	ICRISAT General Director	Patancheru
Rao	Male	66	ICRISAT plant scientist	Patancheru

Appendix 3 - Further Information on Methodology

System Thinking

This methodology is an appropriate lens to study the afore mentioned problems because ecology, after all, is a study of interrelations. Cabrera and Cabrera (2015) explain the essence of system thinking in an elemental four rule approach, DSRP:

Distinction Rule; Any idea or thing can be distinguished from the other ideas or things it is with.

System Rule: Any idea or thing can be split into parts or lumped into a whole.

Relationship Rule: Any idea or thing can relate to other things or ideas.

Perspectives Rule: Any thing or idea can be the point or the view of a perspective.

Systems theory recognizes that any particular thing we experience is part of a greater system and ultimately of a whole (earth). Likewise, to understand our ecosystems we have to examine how different systems interact with each other. Gregory Bateson brought up that “While I can know nothing of anything in particular, I can know something about the relationship between things”. Little can be known about soil if we do not consider the microbial presence. Identifying various systems within our study, and studying the sub-systems of them and how they interact, gives us venue to assess the complicated nature of interrelations. The idea that everything in the world connects to an ultimate greater system can become a problem, however. As Dominique Desjeux famously said “Reality is a whole, but the observation of reality as a whole is impossible”. This is not meant to be preventative to the gaining of knowledge, rather a humbling realization that an omniscient understanding is impossible.

Social change and the adoption of new knowledge claims such as the imperatively of an ecological age are heavily attached to the way we as individuals make sense of the world. The perspective rule is then formative to this research because it recognizes a large part of our choices come from beliefs.

The agrarian crisis in India is an immensely complicated issue resulting from a plethora of interconnected issues. Adopting system thinking methodology helped me understand the shared relationships that villages had when they chose to convert to ecological practices.

Grounded Theory

Grounded theory emerged in 1967 (Glaser and Strauss) at a time when qualitative research lacked the methodological rigour that held quantitative research reputable according to the dominating science at the time. What grounded theory offered, was systematic analysis that combined explicitness and flexibility (Charmaz, 2008).

Today, grounded theory is the method most cited in qualitative research (Bryant and Charmaz, 2007). Most who employ it, however, use little of the prescribed methodologies of Glaser and Strauss (1967) or interpreted them beyond recognition from the original grounded theory. Debate on the proper interpretation of the theory has created confusion, most notably among outsiders of this type of research. While I chose Kathy Charmaz’s (2014) constructivist approach for this study (see Table III), two tenets which I adhered to for methodological rigour to the core essence of grounded theory were constant comparison and theoretical sampling.

Table III – Fundamental Steps of Constructing Grounded Theory

STEP	STAGE	DESCRIPTION
Determining Scope of Study	Onset	Scope of study is defined. Preliminary research questions drawn up and tentative strategy is devised. The social world is not as predictable as the laboratory; scientists need to be adaptable to the realities of the field.
Data Gathering	Until theoretical saturation	Use of ethnographic methods, intensive interviews, consultation of internal documents. While according to Glaser “all is data” (Charmaz, 2008), difference in quality, relevance and usefulness will put limits on gathering.
Coding	Analysis	Several rounds of coding are used to ‘break up’ the data. According to Charmaz (2014:46) “coding is the pivotal link between collecting data and developing an emergent theory to explain these data. Through coding, you define what is happening in the data and begin to grapple with what it means”. Different coding methods (i.e. line by line coding or pivotal coding) are used at different stages of the research.
Memo writing	Analysis	Emergent prominent codes can be written about in depth through memo writing. Ethnographic field notes can also supplement memos. This is an opportunity for the researcher to bring out and clarify ideas and serves as a mid step to writing the final report.

Theoretical Sampling	Sampling and data collection	Use of mental/digital models to compare data is used. There is a constant comparison between emergent codes, new data and memos in order to understand relationships and see patterns.
Theoretical Saturation	Sampling, data collecting and analysis	Once suitable patterns can be recognized, apparent missing gaps in the research are filled until no new data is affecting the research problem, the researcher can now refine substantive theory.
Production of Substantive Theory	Analysis and interpretation	Grounded theory does not emphasize the creation of universal truths, rather, seeks to generate theory valid to a given context. The theory is thus transferable to similar contexts as opposed to generalizable to the greater world.

Inherent in the above description is the emergence of the method. As a foreigner, I had to select proper methodologies to study Indian agriculture to cope with the vast discrepancies between farming systems in India as compared to those familiar with me. Constant comparison of data findings then became a necessity to understanding the agrarian situation in India. I found the perpetual building of theoretical models to explain research findings as inherently ecological and well suited to system thinking. These were important factors that influenced my choice of grounded theory methodology.

Constructionism

While terms like realism and relativism (or positivism/constructivism) may sound alien to most, these opposing worldviews are of great philosophical debate when assessing whether a knowledge claim is true. A realist would say that ultimate truth is out there to be discovered while a relativist would say that truth is constructed. The great scientific progress in the physical, hard sciences has created a theoretical hegemony towards realist knowledge claims. In fact, several anthropologists of the 1970's felt compelled to provide their findings in quantitative terms which are viewed as more concrete than qualitative findings.

Agroecology emerging as an interdisciplinary, holistic study of agriculture will encounter confrontations as its researchers borrow methodologies from neighbouring fields that are often considered 'less-scientific' than the traditions of agricultural science. This is part of the same thought complex that believes 'western' development to be the correct and only way to manage global economics. As such, the purpose of this paper is twofold: to investigate the adoption of alternative agricultural practices with use of alternative scientific methodologies (qualitative measurement and constructive inquiry) in hopes of justifying both. The necessity of exchange between scientific disciplines is explained by the holistic scientist

Gregory Bateson: "Every science, like every person, has a duty toward its neighbours, not perhaps to love them as itself, but still to lend them its tools, to borrow tools from them, and, generally, to keep the neighbouring sciences straight." (Bateson, 1972:249)

A constructionist stance appealed to me because of the approach places more emphasis on the views, values, beliefs, feelings, assumptions and ideologies of individuals than on the method of research (Creswell, 2007). This is relevant because in a field like agriculture that is often a life-long and family affair, a person's choice of practice is a result of all these variables, and is often defended piously.

Specifically, the constructionist approach assumes: (1) Reality is multiple and constructed as opposed to being ultimate and discovered; (2) the research process emerges from interaction; (3) the researcher's and participant's paradigms; (4) the researcher and researched co-construct the data which are a product of the research process, not simply observed objects of it (Charmaz, 2008). Being a student of agroecology and a practicing organic farmer, it was important to recognize my bias towards ecological methods throughout the study.

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Appendix 4 - Reflection on Research Process

So you want to do Action Research?

Action research is an alluring emergent methodology because it emphasizes a drive of change and an act of involvement on all those who participate. However, it does have obstacles: it is generally time consuming, requires great integration by the researcher and the results of the research ultimately need to be upheld and pursued by the researchers themselves. While there are notable published works that achieve all the above (Bradbury 2015), executing good action research requires an incredible amount of skill and dedication.

The pedagogy of the program this thesis is being written for emphasizes learning how to be an agroecologist by being an agroecologist; through action learning (Lieblein et al.

2004). A large aspiration of my time in India was to study agroecology while actively being an agroecologist in the field. This chapter is my experience participating at the Centre for Sustainable Agriculture and serves as a reflection piece for my study.

Interning at CSA

The ground reality of many non-governmental organizations is their busy nature. Arriving as a foreigner for a four-month study makes integration into on-going projects difficult. Although I had my own project to accomplish, I was very much interested in getting involved at the CSA to compliment action research methodology, build relationships with coworkers that would allow me greater access to information and contacts and to learn how an organization operates in ecological agriculture. My first initiative at the CSA was to study their published documents to get a better understanding of their work. After noticing several grammatical errors, I began rectifying what published work I could find. It then became normal for me to help my colleagues as they would ask me to look over the work they were currently working on. This gave me greater access to internal documents and activities of the organization. However, I anticipated collaborating more than just seeing work on paper, and to avoid being a wall flower during the entirety of my journey in India, it became evident during week three that I needed to hire my own translator as waiting around the office for when English-speaking field staff were available was holding onto promises that were never met.

Today I began to inquire about hiring a translator to assist me in field visits. Asking the secretary at the organization turned into a crowd of office staff discussing the issue in Telugu. The decision was back where I started: no need to hire anyone, just follow field staff when they go out. This was frustrating because my time in India is limited and I did not come all this way to wait in an office... Research Journal 23/05/15

I had been forewarned by my supervisor that my host organization would be protective of me and that this could be hindering to my research. I then found it was important to get out around the city and meet people during my stay in India. After about three weeks I had made friends that offered to accompany me on my field visits. Here I learned that there was a balance that was needed to be achieved. While the CSA gave me much insight and contacts, solely sticking to the agenda they had for me would have involved a lot of down time. While I did remain affiliated with the CSA during my whole stay, several times I left the office, often over a week at a time, to get out and spend the time that I needed in the field. While I was discouraged to go out independently at the beginning of my stay, before I left, the office was impressed at the amount of travelling I had done. I would recommend other foreign researchers to do the same, stay with an affiliated organization until you are comfortable, get contacts as you can, but go out on your own accord as soon as possible. Often being accompanied by field staff meant having to return home by evening. With a hired staff, they are glad to stay longer as this means more hours worked.

Entering the Field

As I began field visits, I was continuously humbled by the discrepancy between the agriculture of India and that which I was accustomed to. At times I felt that my combined experience of farming and degrees in agriculture were not worth much. However, I learned to take this as an added obstacle and document/study what I observed as opposed to contributing my knowledge/experience as a farmer. Later on in my visits this became not

possible as farmers insisted to get tips and opinions from me. By then, I had followed the CSA to an extent that I could discuss strategies and methods that I had studied in publications and seen on various farms. As young researchers, we can often be like grasshoppers willing to jump around and get everywhere efficiently right away. It was evident during my stay in India that time is a requirement to get a good understanding of the situation and to make good assessments worth of being related.

In January, I went to visit the Deccan Development Society (DDS) located a few hours from the CSA office. I had already met two Swedish interns that were stationed there for four months. When we met up again, we immediately spoke of our struggles being present as foreigners with organizations that were resource limited. I had been quite hard on myself in the past several weeks and went as far as to ask my supervisors for an extension on my thesis. Though when we compared research experiences, the Swedish interns were very much impressed at how much I had gotten around and what my future plans were while they left their village of Paspatur quite seldom. This was when I realized the importance of talking to others about our research experience as opposed to keeping to oneself. Keeping a journal allowed me to look back to a few weeks earlier or even a month back to look how I had progressed, but discussing with others who were going through the same experience gave a greater perspective on my time in India.

Sometimes during my research, I was confronted by the farmer I was visiting:

You come here with your nice shirt and recorder expecting to tell me something about my farm. How would you know anything? I have been here 15 years, you only 15 minutes.

While such encounters were seldom, most farmers being glad to have a visitor, they did happen. I proceeded with a discussion as usual, asked farmers for their opinion and followed with the mode of action of CSA of incremental approaches and being open to other's ideas. A breakthrough happened later on in this visit, when he asked me how he should control white flies on his mango, I mentioned:

You cannot control disease. You can manage it, but controlling it 100 per cent is an illusion. You will destroy far more than only your disease if you believe you can control microorganisms.

The farmer in question said my input was correct and was then curious to know what suggestions I had to help keep the white fly population in check. Having visited other organic mango farms, I then acted like other CSA extension staff, simply relating tricks that other farmers were doing. This experience occurred towards the end of my time in India and demonstrated to me how extension work can be successful, even with apprehensive farmers.

Example of action work

In terms of my anticipation of 'studying agroecology while actively being an agroecologist in the field', my contributions entailed:

- Befriending an English sociologist and referring him to the CSA where he was able to conduct a focus group for a rice blast project which I assisted in.
- Take part in the organization and garden demonstration building of the National Permaculture Convergence.

- Provided agroecological analyses of two farms that I visited, these short documents were supplied to the requesting farmers.
- Work on biodiversity reports with the CSA for various states.
- Write a field report for the Open Source Seed Network Training on Participatory Seed Selection and Development which occurred on January 4th to 6th in Varanasi.
- Write practical growing guides for tomato and eggplant.

Language barriers, time limits and unfamiliarity with the agrarian situation made me unable to incorporate my research further with my research subjects.

Strategy and reflection of thesis

Given that this was an introductory visit to India, there was a limitation on what I knew to be important and worthy of study. According to the Kolb learning cycle (1984), actively experimenting with abstract conceptualization leads to richer concrete experiments than were possible before initially going to the field. The completion of this thesis led me to a deeper understanding of what is possible as a foreign researcher in such a distant land. While I do feel that my research lacked several aspects, such as a more defined scope or something that could be taken up by those who I worked with in India, I recognize that more time or luck would have been necessary to accomplish a fuller and deeper work. The approach I chose to this project was extremely constructive, being influenced by a line from Bateson: “An explorer can never know what he is exploring until it has been explored” (1972:2). As a first trip to India and a first time performing research, this mantra was suitable. However, if I perform research again, I would keep this mantra for a descriptive study and only use more defined methodologies, such as grounded theory, for more specific issues. I found my research to be quite broad and at times difficult to conjure a theory for. Had I stuck to solely describing a few farmers’ experiences, the broadness of my study would have been more suitable. Though researching something like transition, I feel a richer study would have been possible had I looked deeper on such topics expanded upon in “extending the research” section.

Ultimately, I am very pleased with the outcomes of my time in India and the insights I gained in terms of global agriculture and the workings of an organization operating in ecological agriculture. I am inspired to work in the ecological agricultural sector, perhaps as an extension agent or at least as a politically active farmer.

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