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BACK TO OUR ROOTS: PRINCIPLES OF UNCERTAINTY AS APPLIED TO MONITORING AND EVALUATION OF GENDER AND CLIMATE CHANGE WORK

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“Although many CCA [Climate Change Adaptation] programmes may look similar to other development interventions, they do have specific and distinct characteristics that set them apart. These stem from the complex nature of adaptation itself. CCA is a dynamic process that cuts across scales and sectors of intervention, and extends long past any normal project cycle. It is also inherently uncertain: we cannot be entirely sure about the course of climate change consequences, as these will be shaped by societal decisions taken in the future. How then should we define, measure, and assess the achievements of an adaptation programme?”¹

Introduction:

In deconstructing the notion of human beings as living ‘outside’ nature, Glazebrook tells the following story:

“Humans are animals, and embodiment entails natural processes. At a recent conference, a speaker who urged the audience to ‘get back to nature’ was quickly challenged: when had he left? He had been seen eating breakfast.”²

Climate change is a big reminder of this reality. Thinking of ourselves as outside nature allowed us to not take notice of where our waste went, or to see how limited the ability of the atmosphere to absorb greenhouse gases was, and global warming is important in reminding us that in fact we never left. Unfortunately, it takes time for our dominant knowledge systems to catch up with that reality. The assumption that we can abstract

¹ . Bours, D., C. McGinn, and P. Pringle Twelve Reasons Why Climate Change Adaptation M&E Is Challenging. SEA Change CoP, Phnom Penh and UKCIP, Oxford, 2014, pp. 1. Available at <http://www.ukcip.org.uk/wordpress/wp-content/PDFs/M&E-Guidance-Note1.pdf> . Last accessed 25 April, 2014.

² . Glazebrook, Patricia “*Ecofeminist Cityzenry*” in Stefanovic, Ingrid and Stephen Bede Scharper (eds.) The Natural City University of Toronto Press, Toronto, 2011, (174-190), pp. 179.

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from nature sufficiently to pursue a neat and tidy experimental method still underlies much development work. However, with climate change, we are increasingly being forced to accept that such an approach is not useful. Instead we are better off conceding the principle of uncertainty: not only can we not know everything we need to know, we also will never be sure quite how much we do not know. Throughout this essay, I will use food supply as a practical example, since it is not only a deeply gendered process, but also a timely reminder of the fact that we never left nature behind.

This essay looks at how to apply the principle of uncertainty to monitoring and evaluation (M&E) of gender and climate change work. It is necessary to pay analytical attention to this problem, since M&E of climate change adaptation is widely agreed to be different from previous development work. It has been observed that the best way to approach the issue is to negotiate principles of M&E in the initial stage of project planning. However, so far it has not been possible to do this for the simple reason that the first few projects did not know what to expect. Now, however, we are in a better position to begin to develop a gender-specific methodology for climate change adaptation. This will come in handy for people planning future projects.

4 Questions On The Principles Of Uncertainty

The key factor which makes M&E of climate change work different is that we are unable to proceed in a linear fashion towards a known goal. Climate change is a process still unfolding, and we cannot be sure what is going to happen. I will explain the problem of uncertainty in four parts:

The first question is: we are evaluating as compared to what? In food production it is rarely possible to set a baseline. As the Intergovernmental Panel on Climate Change WGII observes:

“Formal detection of impacts requires that observed changes be compared to a clearly specified baseline that characterizes behaviour in the absence of climate change. For food production systems, the number and strength of non-climate drivers, such as cultivar improvement or increased use of irrigation and fertilizers in the case of crops, make defining a clear baseline extremely difficult.”³

³. Porter J R, Xie L, Challinor A, Cochrane K, Howden M, Iqbal M M, Lobell D, Travasso M I. *Food Security and Food Production Systems*. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, pp. 20. Available at <http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5->

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How could we possibly know what would have happened in the absence of climate change? Setting such a baseline would under any circumstances require an element of speculation which cannot possibly be considered scientific in the positivist sense. Moreover, it would in most circumstances require expertise and expense far in excess of that normally at the disposal of gender projects. Bours *et al* note that the problem of “..establishing a counterfactual (i.e. what would have happened in the absence of an intervention) is a fairly common M&E challenge. However, long timescales and uncertainties can make it harder to build up a credible picture of what may have happened (or will happen) without CCA efforts.”⁴ As such the notion that there can be an absolute set of indicators demonstrating concrete impacts is unsuitable to a gender and climate change project. In fact, across the board, there is increasing recognition that results-based management (RBM) may drain energy and attention from what is important in CCA projects:

“There is dissatisfaction in some professional quarters that RBM is top-down, donor-driven, and serves primarily to satisfy bureaucratic reporting requirements. It is important to recognise, however, that logframes and indicators can be designed with flexibility and innovation... This approach may help tame ‘indicator overload’ that sometimes mires programme staff and evaluation reports.”⁵

A feminist approach to M&E would be very familiar with this problematic. Gender-based violence (GBV), for instance, is a similar scenario to climate change in the sense that it is a multi-causal phenomenon with one effect. There are many different factors which cause violence against women, and so an approach which addresses several different causes while seeking one outcome (a decrease in GBV) encounters a similar problem with setting a baseline. Because rape is an under-reported crime with (to give a South African example) an estimated one in nine cases of rape ever being reported, it is impossible to know where you started and therefore you cannot set a quantitative target for outcomes.⁶ The best you can do is measure process: did you provide the processes set out in the proposal, such as workshops, papers, etc? This makes sense in climate change work since adaptation is a process, not an end in itself.⁷

The second part of uncertainty is: we are evaluating as compared to where? I shall refer to this as the problem of location. The knowledge you need might be available on a global level, but not at the local level. This would be the case with weather patterns,

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⁴ . Bours *et al* Twelve Reasons, pp. 4.

⁵ . Bours, D., McGinn, C., and Pringle, P. Selecting Indicators For Climate Change Adaptation Programming. SEA Change Cop, Phnom Penh and UKCIP, Oxford, 2014, pp. 3.

⁶ . Abrahams, Yvette Monitoring And Evaluation Of Gender-Based Violence Work Paper prepared for the Western Cape Provincial Women’s Summit on the 11 August, 2009, Cape Town, 2009.

⁷ . Bours *et al* Twelve Reasons, pp. 6.

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for instance. The detailed local knowledge of changes in rainfall patterns is just not there, and in a developing country such as South Africa is never likely to be there. That kind of knowledge is simply too expensive. All you have to go on is local people's knowledge of secular changes which may be detailed and exact, but will still not speak to the detailed technical meteorological analyses we have for regions and for the globe. Conversely, your knowledge of power relations amongst the people with whom you are supposed to implement your project may be rich and deep. But there will not necessarily be a global or regional analysis of an issue such as gender dynamics in relation to land and food security which pays attention to climate change. There is a disjuncture in the knowledge which, while not necessarily conceptual as in the first problem, remains a problem of research resources and therefore of available budgets and capacity. While it is to be hoped that especially the second type of knowledge gap will be filled in the future, for practical purposes right now when we need to evaluate past projects and plan new ones the knowledge is unavailable. IPCC WGII defines this problem as follows:

"Most non-climatic factors are not very well characterized in terms of spatial and temporal distributions, and the relationships between these factors and specific outcomes of interest (e.g., crop or fish production) are often difficult to quantify. Attribution of any observed changes to climate trends are further complicated by the fact that models linking climate and agriculture must, implicitly or explicitly, make assumptions about farmer behaviour."⁸

We cannot quantify complex and partly unknown factors and attempts to do so (eg. scenario planning) may be useful in giving us a starting point around which to theorize, but as we try to make such scenarios approach reality they collapse under the burden of too many variables. Food supply is an excellent example of such a case since food production, consumption and distribution is essentially an interface between the ecosystem and human society. Its essence lies in interrelationships, and that is exactly what becomes difficult, if not impossible, to capture using quantifiable data sets.

While theory of change approaches have been recommended as a way out of this conundrum, it is unclear if these are useful for gender work in the global South. For instance, the most comprehensive approach to date has little to say about gender work except the somewhat cryptic observation that:

"ToC is especially well-suited for the design, monitoring, and evaluation of complex, multifaceted, long-term endeavors and 'wicked problems' like climate change, conflict transformation, and gender equality. It is not without its critics, however, and there are concerns that if misapplied it might become an onerous (and potentially confusing) bureaucratic requirement rather than a vehicle for transformation."⁹

⁸ . Porter J R *et al* Climate Change 2014: Impacts, Adaptation, and Vulnerability, pp. 20.

⁹ . Bours, D., McGinn, C., and Pringle, P. The Theory Of Change Approach To Climate Change Adaptation Programming. SEA Change CoP, Phnom Penh and UKCIP, Oxford, 2014, pp. 2. Available at <http://www.ukcip.org.uk/wordpress/wp-content/PDFs/M&E-Guidance-Note3.pdf> . Last accessed 25 April, 2014.

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While theory of change approaches are certainly a big improvement on a mechanistic quantitative approach which seeks measurable indicators of impact, as a feminist I would be suspicious of any approach which does not recognize the specificity of gender. Race, class and other intersections are important, but they are not the same. Neither is gender. A methodology which pays attention to power and identity might speak across all these identities, but may struggle to emerge out of a theory of change approach. Moreover, while it is a rule that participatory approaches take longer and are therefore always more expensive, the theory of change methodology proposed is excessive.¹⁰ It looks like it was thought up in an office. The intentions are good, but one needs to be aware of creeping middle class-ness. When deploying this methodology in a setting of, say, women subsistence farmers, one needs to ask: Are the community participants going to be paid for their participation? If not, each hour spent in a workshop has to be counted against the cost of losing an hour's productive labour or an hour's rest. It might be that the women and men concerned would gladly spare the time in the face of looming climate change. It might also be that they simply cannot afford to. Can we? As Kidder has wryly noted: "Front-line development practitioners appear as time-poor as the women we aim to empower."¹¹ Tomorrow's needs have to be weighed against the need to survive today. As such, one's chosen methodology must be fair and realistic in costing how much time can be spent in workshops developing a theory of change.

A second, more philosophical objection is that, simply by having survived in their environment to date, the participants in the workshop may already have an internalized theory of change. It is not clear how an introduced methodology will surface the existing theory. While I by no means exclude the use of Theory of Change where time and funding are generous enough to permit a lengthy process, this should begin by making an effort to establish what is already happening in the community in terms of negotiating interrelationships both internally and externally. People possess knowledge and do theorize, finding solutions in political practice. Unless we surface that possibility, the person whose capacity is being built might be the external facilitator (paid), rather than the (volunteer) community participants.

Moreover, ToC approaches would have to be explicitly negotiated with a funder in advance, properly costed and adequately funded. Some effort would need to be made to ensure that the community is properly compensated for its time. For the near future, it is likely that most gender projects would not be able to afford such an extensive process. Something simpler and more user-friendly – a M&E bicycle rather than the Rolls Royce – might be called for.

The third part of the uncertainty question is: we are evaluating as compared to when? The question of time-scale is all important for both adaptation and mitigation. When it

¹⁰ . Cf. Bours *et al* The Theory Of Change Approach, pp. 9.

¹¹ . Kidder, Thalia *Rapid Care Analysis In Local Development Programmes: Promoting Change With Time-Poor Practitioners* in Röhr, Ulrike and Conny van Heemstra (eds.) Sustainable Economy and Green Growth: Who Cares?, Genanet and Life e.v. , Berlin, 2013, pp. 43.

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comes to mitigation, we know we have to act now, but we also know it may be years (if not decades) before we can halt climate change in its tracks. But the climate is changing at its own pace, as is the science we rely on for predictions. The region we are working in may be wetter now but drier in ten years' time. In the meantime funding constraints mean that projects typically roll-out over three years or, at the most, five years. But the full impact of a measure might not be apparent for decades after the intervention.

The major danger with the timescale issue is that we cannot be playing with people's lives. Although it is early days yet, problems of maladaptation are already occurring in the literature.¹² "Drought-resistant crop strains, for example, may be hardier overall but result in lower average yields if rain is plentiful."¹³ To the extent that assets play a role in resilience, a lower yield in year one may deplete a family's assets and render them less resilient in year two. Similarly, moving people off floodplains may make sense in areas hit by floods, but one then needs to consider why people live there in the first place. Often it is a response to the fact that it is the only ecological niche left open in an overpopulated world. Moving them to a more marginal area is not helpful.¹⁴

In short, when planning adaptation measures it seems that when emphasizing process indicators, the one we need to prioritize is stimulating learning. We cannot be perfectly sure what future we are adapting to, how long it will take to get there, or precisely what may be needed to get there. Providing content, facts and figures, while important in the short term, is not going to be very useful in the long term since they will change so quickly. But if we are teaching people how to learn, and assisting them to find the assets necessary to learn with, then we have done well:

"Since many uncertainties surround how climate change will unfold and what will constitute successful adaptation, the learning function of M&E will provide critical benefits to society. Without attention to learning as the core function of M&E, we are unlikely to capture successful efforts at autonomous adaptation, avoid maladaptation, or amass lessons about what works. Perhaps even more important, M&E that supports learning can help explain why and how adaptive activities and capacities work."¹⁵

An approach which begins from local knowledge systems, surfacing how people theorize and find solutions in experiential practice, and strengthening people's research skills to find out more of what they need to know, would seem to be the most

¹² . Barnett, Jon and Saffron O'Neill *Editorial: Maladaptation* Global Environmental Change 20 (2010) 211–213.

Available at

https://d3n8a8pro7vhmx.cloudfront.net/nowaterdeal/pages/31/attachments/original/1363981240/Maladaptation_Editorial.pdf?1363981240 . Last accessed 26 April, 2014.

¹³ . Bours *et al* Twelve Reasons, pp. 7.

¹⁴ . Bours *et al* Twelve Reasons, pp. 6.

¹⁵ . Spearman, Margaret and Heather McGray Making Adaptation Count: Concepts and Options for Monitoring and Evaluation of Climate Change Adaptation Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Eschborn, 2011, pp. 20.

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constructive. This means we would work to our feminist strengths. An example reaching far back into our activist history would be the original concept of 'consciousness raising groups' (or, to use the equivalent from the Black Power movement, 'rap groups') which were immensely powerful tools for learning how to learn on a peer-to-peer basis.

Moreover, Tschakert and Dietrich draw our attention to the importance of memory in learning:

"Memory, also referred to as 'experiential grounding', serves as the knowledge base underlying the capacity for anticipating and envisioning future uncertainty and surprise. Consequences of past experiences and the emotions associated with them allow for learning that prevents the repetition of mistakes and opens future choices based on present decisions."¹⁶

This is of course true. But memory is a dangerous thing. If we are to remember how we got here, if we are to tell stories about why we came to need adaptation, then we are going to have to deal with questions of power. After all, if we conceive of the present climate crisis as brought about by capitalism, being a system thriving on unlimited growth (so much so that if it were not carbon emissions it would be any one of at least a dozen pending ecological boundaries being violated which would give way), then asking people why they are poor, how they got to this poverty, and what exactly makes them vulnerable would infallibly bring out memories of injustice.

That would bring me to my fourth question: we are measuring adaptation as compared to whom?

From a gender perspective it is obvious that communities are not homogenous. Instead power is distributed according to identities which ration access to material conditions, justified by social narratives. In other words, a measure which is adaptive for one group may prove maladaptive for another. A measure which is helpful now might be at the expense of future generations, or of other groups in society. One of the easiest adaptation measures to conceive, for instance, would be to move the entire populations of small island states to the temperate regions, where the impact of climate change is expected to be smaller and where certain crop yields may even improve at temperature increases up to 2 °C.¹⁷ The inhabitants of small island states may find this a positive approach. It is unlikely that populations of the global North will agree. So the definition of what constitutes adaptation cannot be the same for everybody. Feminists would have to choose whose definition they will adopt for purposes of M&E.

This logic would make it inescapable that empowering one section of the community, (say women) for resilience, may make another section of the community (say men) feel disempowered. This is not to say that they would be so in reality, in fact I happen to

¹⁶ . Tschakert Petra and Kathleen Ann Dietrich *Anticipatory Learning for Climate Change Adaptation and Resilience Ecology and Society* 15(2): 11, 2010, pp. 11. [online] URL: <http://www.ecologyandsociety.org/vol15/iss2/art11/>

¹⁷ . Porter J R *et al Climate Change 2014: Impacts, Adaptation, and Vulnerability*, pp. 26.

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believe that there are many win/win solutions and that, fundamentally, we shall survive this crisis by evolving as a species or all go down together. But in people conditioned by hierarchical societies, power emerges as something which is always in comparison to someone else. As Woolf's memorable aphorism goes: "Women have served all these centuries as looking glasses possessing the magic and delicious power of reflecting the figure of man at twice its natural size."¹⁸ Were the looking glass to acquire agency, men may well feel threatened.

Though here I have referred to gender identities as power exercised as an immediate interpersonal dynamic, of course women are oppressed also within a broader patriarchal system where the men who have done them an injustice may be far removed physically and the lines of inequality perhaps harder to draw. Yet they are there. To practice adaptation, in short, without simultaneously practicing social justice, is impossible from a feminist perspective. M&E would then involve asking the really hard and difficult questions about whose resilience we are trying to build, at whose (perceived) expense, and how far we are prepared to go in promoting adaptation. Dada and Washington weigh this factor so heavily that they include it in their very definition:

"Adaptation interventions that are intended to be transformative must respond to unjust conditions, whether these are socio economic or systems that are part of the cause of global climate change, rather than merely maintain inappropriate status quo. Reducing poverty and increasing access to resources in a thoughtful climate-appropriate manner can reduce current, as well as future, vulnerability. Transformative adaptation addresses climate change related vulnerabilities in conjunction with developmental vulnerabilities, and supports a change to social and economic systems that improve and protect the well being of humans and nature."¹⁹

I come from a people who have survived and resisted slavery, genocide, colonialism, segregation, *apartheid*, mismanagement and corruption. We are resilient. We possess a theory of change. It is called preparing for the worst and hoping for the best. We do not need to be told to go back to nature. Our land, culture and spirituality was taken from us violently and our struggle ever since has been to regain our roots.

As such adaptation is nothing new to us. The mere fact that I am still here, with a recognizable culture and cultural community in which to be rooted, means I come from generations of experts in the art of growth and change. From this perspective adaptation is a natural phenomenon and not complex at all. The mere fact of anthropogenic climate change should demonstrate that the problem lies not with local people or local economies. The problem lies with a global system of production that has been profoundly maladaptive for the last 250 years or so. As Berry observes:

¹⁸ . Woolf, Virginia *A Room of One's Own* Harcourt Brace & Co, New York, (1929) 1989.

¹⁹ . Dada, Rehana and Laura Washington *Towards Transformative Adaptation: A Climate Change Adaptation Strategy For Oxfam In South Africa*, OXFAM, Durban, 2013, pp. 13.

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"Local food economies, to be genuine, require local adaptation of domestic species and varieties of plants and animals. The universal evolutionary requirement of local adaptation has unaccountably been waived with respect to humans. We need ways of agriculture that are preservingly adapted to the ecological mosaic and even to individual farms and ranches."²⁰

In other words, when we accept uncertainty as an operating principle, we accept that theories developed at a global scale - and rooted in an epistemology which assumes certainty is possible - are not going to be very helpful at all. This leads me to suggest that the problems besetting CCA M&E lie not with the task itself but with the philosophy of measurement. Taking ever finer measurements, calibrating our tools ever more carefully, or seeking to invent new units of measurement are not going to solve what is at heart a philosophical problem, namely that we using a maladaptive science to measure adaptation. Instead we should adopt an approach which is self-reflective. We should seek to measure *the extent to which global solutions become localized*. Where they do not, when local communities fail to adapt (or when they adapt by ignoring every words we say) then we shall have to ask ourselves what it wrong with the theory that it has failed to become rooted in the local. We would need to direct our gaze upwards from the bottom up, and not downwards from an M&E perspective which pretends to somehow stand above or outside of the change and growth it seeks to measure. Sufficient distance for reflection is perhaps possible. Objectivity, or a high level of standardization, is not. The mere notion that that it is possible to provide a single common approach to measurement, is misplaced. The best we can hope for is to measure the extent to which we support people to deal with that which we ourselves do not know.

From such a perspective, the task becomes simple. It is what we have been doing for centuries. Adaptation for me means preparing for uncertainty, achieving much with little at the interface of human/nature interaction as an organic farmer. For instance, although long term climate predictions for my area say that we are going to become drier, in actual fact in the short term we are becoming wetter. The best I can do is adapt to both by increasing my water storage capacity. Rain water tanks will slow down floods and hold water for droughts. For the rest I design my local micro-ecology as a water management landscape, with trees, reeds, bulbs, soil carbon and carefully designed drains and dams ensuring that year by year the water storage capacity is increased. The only way to measure my success in an objective sense would to be to know the local conditions as well as I do. This is not practical to do for every farmer. But we can seek to understand the extent to which the people whose knowledge of the micro-climate is most detailed make the critical decisions. This would require paying attention to the local human ecology with respect, affection and good judgement.

²⁰ . Berry, Wendell [What Matters? Economics For a Renewed Commonwealth](#) Counterpoint, Berkeley, 2010, pp. 29.

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Of course if we were to, like Izu Oshima Island in Japan, receive a year's rainfall in one day my tanks would not help.²¹ There are limits to adaptation. As a result I learn humility. This supports Dada and Washington's reasoning that:

"Removing or reducing the cause of a problem is an important aspect of responding to that problem. In planning and implementing adaptation, it is important that there is full incorporation of mitigation objectives, and that adaptation encompasses mitigation as part of its objective."²²

Rainwater tanks are a good example of meeting adaptation needs while practicing mitigation. Every drop from my storage systems is almost carbon free. Woven into a farming system which ultimately aims at capturing solar power through plants and storing it in the form of soil carbon, the tanks assist me to prepare as well as I can. I am re-domesticating indigenous plants as well as exotic hybrids, persuading them to interbreed for climate diversity. They must be able to yield during extreme heat as well as severe cold. I multiply those that survive being underwater in winter and fried in summer. In short, adaptation is not difficult when done locally, holistically and from the bottom up. Maladaptation may well occur, but it will have been through my decisions and not someone else's. I shall blame no one.

Of course I can do all this because I have put the institutional infrastructure in place: title to land, education, access to finance and knowledge and a community of practice. Thus what may prove important in adaptation projects may not be so much what we do but how we do it. If we can build to people's strengths, recognizing that they are here because they are experts at survival, the job becomes simply one of empowering them to make their own decisions: a methodology which is at the heart of feminism. M&E would have to carefully surface this, since the outcome of many years of results-based management is that we do not always pay sufficient attention to how we do things.

Learning From Practice

The remainder of this essay will look at a case study of what may broadly be termed adaptation work with an intersectional approach. It is examined in order to see if a methodology of evaluating learning capacities rooted in the local is possible.

The case I am about to analyse was, ironically, not intended to be a climate change project. Yet it is one of the biggest adaptation and mitigation efforts in the world so far. It has been largely funded by the developing nation itself. While it has definitely not been a self-consciously gendered project, it has shifted relations of power and thus built resilience in ways which have opened the door for women. I refer to the case of Cuban agro-ecological agriculture.

²¹ . <http://www.wunderground.com/blog/weatherhistorian/places-in-the-world-that-have-reported-40-1016-mm-of-rainfall-wi> Last accessed 29 April, 2014.

²² . Dada and Washington Towards Transformative Adaptation pp. 15.

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Cuba in 1990 was faced with the end of cheap Soviet oil. Almost overnight, the fossil-fuel based monoculture based on sugar exports fell apart: "The demise of the Soviet Union created an economic crisis so severe that average caloric, protein, and vitamin intake in 1993 was 30% lower than the levels achieved in 1989."²³ This took place in an already food insecure country. Perhaps fortunately for long term adaptive purposes (although I am sure the Cubans did not find it so at the time) the US blockade cut off any hope of cheap food from an alternative source. In the course of the next decade, Cuba converted production of vegetables and many other staples to an agro-ecological system dependent on locally produced inputs. It did this by, first, restructuring title and usufruct rights in such a way that large state farms were carved up and offered to co-operatives or individual families. Especially in forestry areas, this was accompanied by some state support in the early stages in exchange to the farmer's services in replanting trees. Essentially Cuba dismantled large centralized farms and decision-making was decentralized to the lowest possible level.

It worth noting that the Cuban government promoted urban agriculture as vigorously as rural. Vacant land in cities was given over to people to use and start-up support was provided. One unintended outcome was that both rural and urban eco-systems were restructured to become more adaptive. As Deelstra and Girardet have argued:

"The linear metabolic system of most contemporary cities is unsustainable. It is profoundly different from the metabolism of nature's own ecosystems, which could be likened to a large circle: every output by an organism is also an input, which renews and sustains the whole living environment... On a predominantly urban planet, cities need to adopt circular metabolic systems to assure their own sustainability and the long-term viability of the environments on which they depend."²⁴

The institution of urban agriculture led to recovery of waste streams for compost, such that Cuban cities now possess a very high incidence of worm farms which women excel in running.²⁵ It is claimed in 2008 that over 5 million tons of worm compost were produced each year from what used to be landfill waste.²⁶

²³ . Gonzalez, Carmen G. *Seasons of Resistance: Sustainable Agriculture and Food Security in Cuba* , Tulane Environmental Law Journal Vol. 16, 2003, (686-732), pp. 712. Available at: <http://ssrn.com/abstract=987944> . Last accessed 5 May 2014.

²⁴ . Deelstra, Tjeerd and Herbert Girardet *Urban Agriculture and Sustainable Cities* in Bakker, Nico and Mariëlle Dubbeling, Sabine Gündel, Ulrich Sabel-Koschella, Henk de Zeeuw (eds.) *Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda*, Deutsche Stiftung für Internationale Entwicklung, Feldafing Germany, 2000, pp. 51.

²⁵ . Sosa, Braulio and Adilén Jaime, Dana Lozano, Peter Rosset *Agroecological Revolution: The Farmer-To-Farmer Movement Of The ANAP In Cuba* National Association of Small Farmers and La Via Campesina, Havana, 2013, pp. 150.

²⁶ . Cuba Agriculture "Agriculture in Cuba Today". Available at <http://www.cubaagriculture.com/agriculture-today.htm> . Last accessed 7 May 2014.

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Second, Cuba had already accomplished educational reforms, having by the 1990's created one of the highest rates of compulsory education in the developing world. Although Cuba possessed 2 % of the Latin America's population, it housed 11 % of the regions scientists.²⁷ For our purposes it is interesting to note that, although the division of labour in the home remained unchanged and Cuba continues to have an atrocious human rights record in respect of Lesbians, Gays, Bisexuals, Transgendered and Intersex people, yet Cuban women in 2007 “.. made up 46% of the labor force of the country, 66% of technical and professional workers, 55.5% of doctors, 70.1% of judges, and 52.2% of health professionals working.”²⁸ The high level of general education meant that the rapid conversion of agricultural science from an import dependent high input high output model to agro-ecological approaches could occur in close conversation with the farmers who needed the knowledge. These in turn possessed the capacity to respond literately and critically to potential maladaptive responses.

Third, after many mistakes and false starts, a farmer-to-farmer movement inspired by peasant movements in Nicaragua and Guatemala was formed in 2001, which had as its purpose the spread of peer-to-peer agro-ecological knowledge, facilitating the co-operation between scientists and indigenous knowledge systems exponents, and expanding the agro-ecological movement. This movement, ANAP, today has over 100 000 families as members, making it one of the biggest networks of agro-ecological knowledge in the world.²⁹ Perhaps the most useful of its many innovations has been the Banes method, named after the valley in which it was invented. The Banes Method is a 12-step process specifically designed for participatory rapid assessment and problem solving. It was motivated, says ANAP, by the need to spread successful technologies faster and to recruit new peer educators. The prospect of reducing dependency on external facilitators was also a powerful inducement, since this dependency meant that the spread of new technologies was limited by available funding.³⁰ While the Banes method no doubt has its critics – hasty is not always well done – it is nevertheless breathtaking both in its simplicity and empowering potential.

The formation of ANAP points to the critical role foreign funding can play as a catalyst to unlock local resources. The beginnings of ANAP were funded in 1999 by the German funder Bread for the World, Oxfam, and the French Catholic Centre For Development. The program struggled on for about six years, with few discernable results. However, by 2006 the program took off and is now not only successful but largely self-funded. Had they been evaluated on a short term basis in 2002, it is likely that the program would have been closed down. In fact, it is only at this distance of time that one can see the slow beginnings of the program like yeast in a loaf of bread. Good things take time to work.

²⁷ . Gonzalez, Seasons of Resistance, pp. 723.

²⁸ . Sosa, Agroecological Revolution, pp. 148.

²⁹ . Sosa *et al* Agroecological Revolution, pp. 69.

³⁰ . Sosa *et al* Agroecological Revolution, pp. 112.

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A testimony to the success of these combined factors is that:

“ .. agricultural production steadily recovered from the economic crisis of the mid-1990s. The gain was achieved by increasing productivity rather than increasing land under cultivation, and reflected a reorientation of Cuban agriculture to produce more food for the domestic market in addition to producing for export. Production levels for staple crops such as plantains, beans, cereals, potatoes, and tomatoes have increased significantly since 1994, and *are often higher than pre-crisis levels.*”³¹

In other words, moving away from fossil fuels led to a net increase in food security for the average Cuban. By 2003, only 16 % of food needs were imported.³²: “Cuba’s average daily per capita dietary energy supply in 2007 (the last year available) was over 3,200 kcal, the highest of all Latin American and Caribbean nations.”³³ This appears to be by no means unique for mass re-conversions to agroecology. For instance, a similar development in Bolivia led to such increases in productivity that farmers began to reduce areas planted. They felt that there was no need to work so hard.³⁴ This greatly reduced the workload of women, who were better able to manage farms when the men were absent seeking work.

The mass conversion to agro-ecology also increased climate resilience. It is claimed that: “In 2003, the Cuban Ministry of Agriculture was using less than 50% of the diesel fuel it used in 1989, less than 10% of the chemical fertilisers and less than 7% of the synthetic insecticides.”³⁵ This would represent a degree of mitigation which outstrips that of any other country except perhaps Germany and Norway.

In addition, there is the effect of carbon capture and storage in soil carbon due to agro-ecological farming methods. While there is no baseline, and thus no precise quantitative data for Cuba, it has been well demonstrated that increasing the water storage capacity of the ecosystem also increases the amount of carbon that can be stored. Thus the significance of re-vegetation of former forests and grasslands lies not just in the above-ground biomass provided but also in the fact that forests and grasslands provide wonderful environments for the retention of soil carbon, or humus. Bell and Lawrence estimated that:

³¹ . My italics. Gonzalez *Seasons of Resistance*, pp. 725.

³² . Altieri, Miguel A and Fernando R. Funes-Monzote *The Paradox of Cuban Agriculture Monthly Review*, pp. 3 of 8. Available at <http://monthlyreview.org/2012/01/01/the-paradox-of-cuban-agriculture> . Last accessed 7 May 2014.

³³ . Altieri and Funes-Monzote *The Paradox of Cuban Agriculture*, pp. 4 of 8.

³⁴ . Natural Resources Management and Environment Department *Lessons From Certified And Non-Certified Organic Projects In Developing Countries* in *Organic Agriculture, Environment and Food Security*, Food and Agriculture Organization of the United Nations, Brazil, 2002, pp. 6 of 26. Available at <http://www.fao.org/docrep/005/y4137e/y4137e00.htm> . Last accessed 7 May, 2014.

³⁵ . Cuba Agriculture “Agriculture in Cuba Today”. Available at <http://www.cubaagriculture.com/agriculture-today.htm> . Last accessed 7 May 2014.

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“Carbon stored in soils worldwide represents the 3rd largest sink in existence, after oceans and geologic sinks. There is 2-4 times as much carbon stored in soils as there is in the atmosphere and approximately 4 times the carbon stored in vegetative material (i.e. plants). It is therefore understandable that the soil carbon sink is being viewed as one that could potentially have a significant impact on sequestering CO₂ emissions”³⁶

The technology to do so is perfectly straightforward, and has been practiced by indigenous, organic and agro-ecological farmers or foresters for centuries. Lasalle and Hepperley summarized almost three decades of research as follows:

“During the 1990s, results from the Compost Utilization Trial (CUT) at Rodale Institute—a 10-year study comparing the use of composts, manures and synthetic chemical fertilizer—show that the use of composted manure with crop rotations in organic systems can result in carbon sequestration of up to 2,000 lbs./ac/year. By contrast, fields under standard tillage relying on chemical fertilizers lost almost 300 pounds of carbon per acre per year. Storing—or sequestering—up to 2,000 lbs./ac/year of carbon means that more than 7,000 pounds of carbon dioxide are taken from the air and trapped in that field soil.”³⁷

The same paper cites longitudinal studies to show that a depleted soil farmed organically will show rising levels of soil carbon until a steady state is reached after about three to five decades. It is not necessary to seek more adequate data for Cuba. Soil carbon is infamously difficult in any case to measure exactly, which is one reason few people within the UNFCCC system take it seriously. It does not lend itself to carbon marketing. Suffice it to conclude that the Cuban experiment with agro-ecology turned a net carbon emitting system into a net carbon storing system. If every country could do that, we would not have to adapt.

That said, it remains only to observe that the adaptation achievements are equally impressive. Thus, “In 2008, after the impacts of 3 hurricanes in the country, rural family agriculture showed good indices of resiliency with only a 13% drop in production compared to 2007. Agro-ecology plots and plantations had fewer losses, around 50%, while monoculture plantations lost between 90% and 100%.”³⁸ Part of this success was due to improved water management systems. But the other part had to do with farmers

³⁶ . Bell, M. and Lawrence, D Soil Carbon Sequestration - Myths and Mysteries The State of Queensland, Department of Primary Industries and Fisheries, 2009, pp.1.

³⁷ . LaSalle, T.J and Hepperly, P. Regenerative Organic Farming: A Solution to Global Warming Rodale Institute, Pennsylvania, 2008, pp. 5.

³⁸ . Oxfam The Climate Changes, Threatens And Demands Adaptation: A Look At The Cuban Experience Of Protection Against Climate Change, London, 2011, pp. 26. Available at <http://www.oxfam.ca/sites/default/files/Oxfam%20report%20-%20A%20look%20at%20the%20Cuban%20experience%20of%20protection%20against%20climate%20change.pdf> . Last accessed 7 May, 2014.

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who made the decisions and felt a sense of stewardship with the land simply being more committed to the revival of ecosystems after extreme weather. Thus:

“In cases where the [ANAP] farming family lives in or near the farm, it was noted that they worked hard on the farm in the days following the disaster. For example, many of the taller trees that had been felled were put erect again, supported by sticks and stones. It was clear that many of these trees were saved, and that they would survive. In contrast, almost no evidence of such recovery efforts were observed in monocultural crops that had been felled.”³⁹

In increasing resilience, placing land rights, decision-making and knowledge creation in the same place and embodying it in the same people certainly has paid off in the case of Cuban agro-ecological systems. When people felt a sense of ownership and control, the solution to recovering from disasters was simply to work hard and hope for the best. Whether it is the increase in knowledge that leads to a greater sense of self-empowerment, such that one is confident to prop up felled trees with sticks and stones and believe this is going to work; or whether it is the ability to self-organize and engage in peer-to-peer networks which leads to an increase in knowledge about the ability of trees to survive hurricanes, is perhaps not germane. The point is that it is a method that works because agro-ecological farming builds people’s ability to learn from experience and application. As FAO observes:

“Agriculture systems become more productive when human capital increases, particularly in the form of farmers’ capacity to innovate and adapt their farm systems for sustainable outcomes. Sustainable agriculture is not a concretely defined set of technologies, nor is it a simple model or package to be widely applied or fixed with time. It needs to be conceived of as a process for social learning.”⁴⁰

In this sense we could read increased Cuban agricultural productivity in the teeth of climate change as a successful demonstration of the way the agro-ecological project improved human ability to learn. While here the improvement in agricultural productivity has been used as one indicator of success, surely the more fundamental indicator must be that success was due to the rapid institutionalization of learning processes. With these in place, a similar process of teaching Cuban men to not be married to *Machismo* culture can surely not be far behind. In the meantime, the fact that Cuban women and girl-children are eating well with less labour is surely no small contribution to gender equality.

³⁹ . Sosa *et al* *Agroecological Revolution*, pp. 26.

⁴⁰ . Natural Resources Management and Environment Department *Lessons*, pp. 5 of 26.

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