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Initiatives in Context: Agricultural Productivity, Water, and the Paradox of Ethiopia

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Abstract: *This paper will look at Ethiopian policies and their effect, in most cases negative, on water issues, irrigation, and agricultural productivity in the country. Additionally, this paper will address how water issues, irrigation, and agricultural productivity affect the health of Ethiopians and the resulting food and seed aid required to help many individuals and communities survive. This paper is designed to illuminate the paradoxes Ethiopian officials, local communities, and development agencies work to solve. Many initiatives will be discussed, some in detail others more generally, and the details that render them successful or failures will be addressed.*

Background

It is important to place many of the development projects and issues, in Ethiopia, within a context. This allows for a large scale understanding of the country's difficulties and paradoxes that make development a tricky undertaking. Ethiopians must combat disease, flooding, drought, water stress, and pests in the face of a poor national infrastructure (Ogbaharya 2009). This makes them highly vulnerable to the severe climatic changes (Bekele 2004) that frequently ravage the country and contribute to the perpetual state of poverty and food insecurity throughout the nation. To some extent, due to the subsistence nature of farming in the region insects, mammals other than livestock, a lack of fertilizer, theft, and weeds (Assefa et al. 2008) also provide constraints on agricultural productivity which are exacerbated by the over estimation of grazing capacity, land-use changes, expansion, resettlement, and an increasing national population (Anbessa and Bejiga 2002). Given the above mentioned obstacles to productive agricultural

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outputs farmers' major concerns (Bekele 2004) center around frequent drought, soil erosion, shortages of farmland, water conservation, lack of grazing land, crop disease, and pest control. This survey is fairly representative of most surveys of farmers' perception found in the literature and sheds light on an interesting dilemma, not once is irrigation mentioned as being a major concern for farmers, yet as this paper will illustrate a majority of projects in Ethiopia have been designed to establish irrigation networks throughout the country. This phenomenon will be addressed later.

National Policies also play a large and varied role in the agricultural and food security issues facing the country's citizens. The land tenure system was created during the militant Derg period (mid-1970s to mid 1980s) and made all land property of the state (Ogbaharya 2009). The Land Tenure system provides each household with a given parcel of land which the family must farm in order to keep their right to be on the land. This process marginalized many indigenous groups, particularly pastoralist communities who moved from area to area grazing their cattle. Many indigenous groups have their own governing bodies that are charged with resource management, a prime example is the Borana people. The Borana elect an aada seera who is responsible for enforcing the rules that govern the use of land and water but this elected official was made obsolete when the government assigned Peasant Assistants to particular regions with the sole task of forcibly settling pastoralists (Ogbaharya 2009). This top down development had long-term consequences for the social and natural landscapes of Ethiopia, which will be discussed below. As political agents, Peasant Assistants worked in concert with extension agents to settle herdsmen and restrict the movements of their cattle to a designated location which subsequently reduced the amount of grazing land available to pastoralists, often giving grazing land to private citizens loyal to the Government (Ogbaharya 2009). The land tenure system resettled individuals based on ethnic affiliation and subsequently, created ethnic regionalism (Abule et al., 2005). The lack of distinct boundaries has resulted in conflict, which is a substantial drain on household resources (Abule et al. 2005). The Government also banned bushfires, one of the primary tools of pastoral resources management, which lead to severe land degradation (Ogbaharya 2009). Currently, the Ethiopian government has failed to initiate policy based on participatory research projects (Ogbaharya 2009).

Another national policy that has had resounding effects on rural communities, particularly in the Awash Basin is the designation of restricted land and resources via the Awash National Park (Anbessa and Bejiga 2002). The park, like the Land Tenure System has severely restricted the movement

of pastoralists and their herds, or at least made the venture far more risky than before by placing heavy sanctions on the practice of grazing animals within park boundaries (Anbessa and Bejiga 2002). Additionally, the conservation practices use within the park and on nearby surrounding areas has a distinctly western flavor, and ignores many of the traditional resource preservation methods practices by indigenous people.

Water Concerns

Although Ethiopia has an abundance of water resources the spatial and temporal distribution of those resources (seasonal rivers, droughts, and flooding) limits the agricultural productivity of the country and makes socio-economic development (Desalegn et al. 2006) a challenge. This also means that water, being a critical resources in short supply, is a significant source of conflict (Desalegn et al. 2006). As mentioned above, there are already contentions about the lack of demarcation of regional boundaries; this is exacerbated by the struggle to secure water resources at a community and household level. Many disputes must be settled via traditional systems by involving village elders, although some individuals opt to pursue justice through formal courts even though there is less indigenous input in these situations (Desalegn et al. 2006).

Water conservation was one of the key concerns for farmers (Bekele 2004) and primarily as it relates to economic losses due to drought (Desalegn et al. 2006). This is a concern held by both rain-fed and irrigation farmers. There are current conservations practices, such as checking dams and water harvesting (Desalegn et al. 2006), in place which farmers tend to in their agricultural activities. Regardless of these conservation practices the problem of drought still remains a significant source of apprehension for many farmers. Drought occurs in Ethiopia approximate every two years and is more common and pronounced in the northern regions (Desalegn et al. 2006).

For pastoralists, they key is to move their herds to various water sources, a practice that has been drastically restricted with the implementation of the land tenure system (Abule et al. 2005). The predicament of restricted movement is compounded by the lack of useable water (Abule et al. 2005). Although pastoralists may find a water source the issue is a matter of quality rather than quantity (Desalegn et al. 2006) a problem linked to the heavy industry in Addis Ababa. In fact the problem is so severe, particularly in the dry season, that pastoralists may have to limit the watering of their herd to every other day and the trip may take thirteen to eighteen hours round trip (Abule et al. 2005), and when there are severe

shortages pastoralists and farmers alike may have to purchase water from pumps of move their herd to a source for the duration of the dry season (Abule et al. 2005).

Farmers are particularly sensitive to changes in water and water shortages. In Ethiopia there are three seasons: Belg, Kiremet, and Bega. Belg is the short rain season from March to April or May and is a less reliable source of rain, often raining enough to grow a tef crop every other year (Rosell and Holmer 2007). This is followed by Kiremet the long rainy season which lasts from July to September (Rosell and Holmer 2007). However five months of the year (if the Belg season actually produces rain) see little to no rain; this dry season, known as Bega lasts from October to February (Rosell and Holmer 2007). Both rainy seasons have become shorter, which, for rain-fed farmers, who are operating as efficiently as possible (Makombe et al. 2007), presents a significant challenge. If, as mentioned before, tef is only grown during the Belg season, due to its ninety day growing season, and there is not sufficient rain for the crop to develop farmers already living on the margins have lost the cost of their input (seed and any fertilizer/labor) and the income they would have received from the sale of a valuable cash crop, tef.

Irrigation

Although Ethiopia's primary economic activity is agriculture, it is often of a subsistence nature. Subsistence farming engages approximately eighty-five per cent of the population (Bekele 2004), however, almost ten per cent of the population receives food aid (Makombe et al. 2007). The government, in hopes of find a solution to this paradox, has pushed the development of irrigation schemes throughout the country.

Irrigation is an ancient tradition in Ethiopia (Aberra 2004) but modern irrigations schemes have been in place since the 1960s (Bekele and Tilahun 2006). These 1960s schemes are often constructed by farmers with their own resources (Bekele 2004) and little help from outsiders (i.e. the government or NGOs). The farmers' irrigation schemes are often rudimentary in their construction with temporary headwork, unlined canals and storage ponds (Bekele 2004) and are washed away annually by floods (Makombe et al. 2007) during the rainy season, only to be reconstructed later.

In the 1980s there was an increase in interest in development of small scale irrigation (Bekele 2004) schemes for rural farmers. The concept was to upgrade existent structures and allow farmers to control, operate, and maintain (Bekele 2004) the irrigation networks as efficiently as possible. In

some cases the government or non-government organizations made upgrades, in others they built completely new structures, however, there was little input or participation from farmers (Bekele 2004). However, these upgraded and new structures consisted of permanent headwork, lined canals, and sometimes lined storage ponds (Bekele 2004).

Although the government had high hopes for small scale irrigation and its effects on economic and agricultural productivity, they were disappointed by some of the baggage that came with such an undertaking, particularly because local resources and knowledge were not utilized. Small-scale irrigation, regardless of the potential benefits it may bring has inherent properties that make it less than ideal for poor rural farmers in an agro-ecosystem characterized by drought –proneness and already suffering from environmental degradation (Aberra 2004). The first, and probably the most significant for the target population, is the high initial investment that irrigation schemes require (Bekele 2004) which is often beyond the means of subsistence farmers. Additionally, as most crops are rain-fed and traditionally somewhat drought tolerant there is little priority placed on irrigation (Bekele 2004).

The failure to improve water management practices and operational routines (Bekele 2004) meant the ultimate purpose, increased water resources for optimal crop production, behind the Government's push for irrigation was destined for disappointment. Irrigation was, and currently is, managed on a fixed schedule, with poor or no land leveling, small plots, and few if any structures to manage water usage in the field (Bekele 2004). Combined these made for a highly inefficient and poor performing water delivery system aggravated by the low water retention and increased infiltration rate of the soil.

Additionally small scale irrigation systems are subject to surface runoff and percolation (Bekele and Tilahun 2006). The models in Ethiopia are often end-dyked circumventing the normal issue of surface run-off but percolation is a major concern (Bekele and Tilahun 2006). Loss of water via percolation can only by mitigated by with an increase in application efficiencies, an area often not addressed by development agencies that come in and establish irrigation structures on rural plots as is evident by the current practice of farmers watering before soil moisture is depleted and in a greater quantities than necessary. For optimal use farmers would need to measure soil moisture and necessary infrastructure and technology—an unrealistic expectation for subsistence farmers who often lack the equipment and knowledge for such measurements.

Secondary salinisation is also a very real concern for farmers with irrigation systems. Tigray has an extensive community of microdam based irrigation schemes, approximately sixty to date (Kebede 2008). This may be of great benefit in the short term with increased production and greater access to water resources but irrigation adds salt to the water (Kebede 2008) which in early stages leads to reduced productivity and eventually, complete soil infertility (Kebede 2008). Vegetation will fail to grow and there can be a great decrease in biodiversity and habitat as the land becomes barren (Kebede 2008). There are some solutions, such as subsurface drainage which reduces salinity and raises the water table but the estimated cost for such an undertaking is $52.2 million (Kebede 2008), not to mention the added social costs.

Those schemes that have been somewhat successful often concentrate on making improvements to existing structures or traditional practices, have a user friendly approach, supplement rather than replace, and do not utilize expensive imported parts, fuel, or technology (Aberra 2004). Those schemes that tend to fail typically utilize large capital intense irrigation that is externally imposed and is saturated with technology beyond the means of the target population (Aberra 2004). It is too expensive to be sustainable in a rural environment and the project fails to consider local knowledge, resources, and participation. The last point is particularly prominent in the following examples of failed irrigation projects. The Arato dam suffers from pronounced seepage and the positioning of the outlet makes optimal usage impossible (Aberra 2004). The Sewhi Meda dam designers failed to account for erosion and the dam was never operational—it held water for two months (Aberra 2004). The last example, Era Kuhila dam, had a significantly worse erosion problem than Sewhi Meda and the capacity is underutilized because the main channel is too small to keep up with the outlet (Aberra 2004). These failures also highlight the problem of programs not promoting voluntary acceptance or adoption of new technologies (Bekele 2004). Policies, particularly in regards to irrigation should encourage self-help and indigenous management groups. Farmers' organizations and water user organizations should be promoted before set up or construction (Aberra 2004) as a way to ensure cooperation and commitment, and where possible already existing coalitions (Aberra 2004) should be utilized, possibly reorganized.

Agricultural Productivity

Agricultural productivity in Ethiopia is directly dependent upon the successful exploitation of water and natural resources and in a country where fifty per cent of the gross domestic product (Makombe et al. 2007) is comprised of agricultural outputs there is a national as well as individual incentive to make the most out of the limited or scarce available resources. Approximately eighty-five per cent of the population in Ethiopia derives their livelihood from farming (Makombe et al. 2007)—ninety per cent in the highlands (Rosell and Holmer 2007)—and almost eighty per cent of the country's export revenue is derived from agricultural products.

Few cultivators in Ethiopia use improved planting material or insecticides (Abule et al. 2005) like western farmers. Genetically modified crops, a staple in western farming practices, are often patented and poor farmers are simply unable to pay the royalties (Egziabher 2003) even if they could afford the expensive seed. The cost of the inputs for GMC combined with poor market integration means farmers would never make enough return on their investment to support a household (Egziabher 2003). Most seed comes from the farmers themselves or through informal channels (McGuire 2008). External inputs and modern genetic varieties are limited but farmer developed varieties have a large range (McGuire 2008). Additionally, farmers may have to re-sow their crops depending on the rain variability which requires they have a large quantity of seed on hand; this is especially the case with lowland farmers who have larger plots, a decreased yield, and rain is more unpredictable (McGuire 2008).

Seed shortfalls are common in Ethiopia and farmer to farmer exchanges fill the gaps making kinship and reciprocal ties very important in Ethiopian agriculture (McGuire 2008). Farmers in need of seed often look to other farmers because they can purchase seed on much more favorable terms. Additionally, they often know the farmer they are purchasing from and engage in mutual activities the cement their reciprocal bond (i.e. labor, oxen sharing, or participation in local institutions); kinship is not necessarily always a factor. Some may argue that this reciprocal seed transaction is a social tool to gain power but the land tenure system and weak market development prevents well off farmers from enriching themselves to the point where they can break free of local social networks (McGuire 2008). Additionally alternative methods of purchasing seed, such as the Government or seed merchants are often less desirable even though they are faster, as they require cash. Cash is not necessarily something rural farmers have on hand—particularly before the planting season. Formal sector seed supply has little

impact in most developing countries because of market failure, or lack of integration, and inappropriate policies (McGuire 2008).

There are emergency seed systems in place supported by emergency assistance to aid in agricultural recovery following a crisis but a lack in the understanding of the social ties and consequences involved in seed exchange make these systems less efficient and often means that useful varieties (i.e. drought resistant, higher yield, suitable to certain conditions) do not reach farmers. Varieties on farms (whether modern or farmer developed) reflect the farmer's demand for different traits (McGuire 2008). Most studies focus on physical or genetic aspects of seed exchange rather than the social norms (McGuire 2008) that are important in dictating who receives seed and who does not and unfortunately seed aid, which has occurred every year since 1974 (Makombe et al. 2007), is based on food security assessment rather than an understanding of how farmers maintain seed security.

As previously mentioned production in Ethiopia is of a subsistence nature which means any cash that households would need must come from the sale of livestock or crop products. Some individuals trade vegetables or other materials for cash (Bekele 2004). In Ethiopia there are two common staples: tef and sorghum. Tef is the staple crop preferred by farmers because of its drought tolerance and higher market price. Tef also has a ninety day growing period which makes it suitable for the short rainy season (Rosell and Holmer 2007). Sorghum is unsuitable because it has a 180-day growing period. Barley and wheat tend to be more popular at higher altitudes (Rosell and Holmer 2007).

Because most of the country is engaged in agriculture of some sort soil degradation is of paramount importance because poor soil results in crop failure as many farmers cannot afford the inorganic input required to enhance soil fertility (Bekele 2004). Farmers are very aware of soil conditions in their area often using crop yield, crop performance, and various soil characteristics (texture, color, etc) as indicators of soil degradation (Moges and Holden, 2007). Farmers are also aware of possible solutions to soil degradation and cited construction of terraces and planting trees and shrubs as ways to improve the soil but less than fifty per cent of participants actually performed these tasks (Moges and Holden 2007). The lack of conservation practices is compounded by run-off, lack of fertilizer, organic and inorganic, and deforestation. Because the plots are so small and farming families tend to be large there is no fallow time for soil to replenish. Perceptions of soil degradation, and therefore efforts to mitigate it, are negatively affected by an increase in the amount of land an individual has at his/her disposal to cultivate (Shiferaw and Holden 1998). Additionally households with less

land to cultivate are more likely to remove conservation structures in the absence of appropriate policies and technology (Shiferaw and Holden 1998).

One measure of improving soil conditions is the application of fertilizer. When available it is applied in the form of manure or cabbage oil but those living far from the village with no animals do not use fertilizer (Assefa et al. 2008) as it is too expensive. Those few individuals that do use inorganic fertilizers (i.e. North Wello where approximately forty percent use) tend to be more educated (Assefa et al. 2008). One proposed solution is the extension of credit to purchase fertilizer (Holden and Shiferaw 2004), with the increase grain production household would be more food secure and increase their overall welfare. (Holden and Shiferaw 2004) mentions that this could be risky in terms of conservation. However if conservation incentives are attached to the credit the potential negative effects could be mitigated. In addition to fertilizer farmers, particularly rain-fed farmers, practice soil conservation via contour bunding ,to prevent erosion and runoff, improved tillage practices (Desalegn et al. 2006), strip cropping, conservation of bench terraces, changing planting dates, weed control, reduction of cultivated area, and the use of drought tolerant crops such as chickpeas and tef. If farmers select the top ten per cent of yielding genotypes at drought stress conditions at a late planting the average yield increases almost 100% (Anbessa and Bejiga 2002). However, knowledge of the problem does not necessarily dictate that farmers will adopt conservation practices particularly if there is expense involved and there is no guarantee they will have sufficient product to repay their debt (Moges and Holden 2007). Additionally, participation in soil conservation activities without incentives may be limited as farmers see these activities as the responsibility of the authorities.

As mentioned in the background information, pest control is a concern for most Ethiopians; however the knowledge of pests and pest control is varied. Traditional methods, such as intercropping are rarely practiced when farmers have access to irrigation (Assefa et al. 2008) and instead they rely on limited contact with wheat and maize, suspected perpetrators of pest infestation, and natural control. One study found that intercropping in ninety-one per cent of the study area and that it reduced the incidence and severity of infestation by twenty-five per cent and sixteen percent respectfully (Fininsa and Yuen 2001). Visual assessments can be a good indicator of fungal infections (Chala et al. 2003) which would allow farmers to determine quality of the crop and take measures against the infestation. However, this information is not relayed to farmers. Some pests are much more significant economically. Trypanosome invasion was

indicated as the reason, universally, that farmers abandoned their farmland (Reid et al. 2000).

Other Issues

Input and output markets are of particular concern to Ethiopian farmers as they often depend on fair market prices when they sell assets during a drought or go to sell crops to purchase seed, fertilizer, or other materials. The inability to pay for fertilizer and improved seed often cost farmers their livestock assets at a lower than fair value because poor grain markets (Bekele 2004). One study found that the Ethiopian markets were well integrated and that the issue of fair market value was not a result of market integration but simply of pricing (Getnet 2007). The study suggested that intervention at the local level is often very costly and should instead target central wholesale markets to influence the price dynamic at local levels (Abule et al. 2005).

Health, Food Aid, and Drought Mitigation

In agriculturally based developing nations environmental degradation leads to soil nutrient depletion and a loss of food production potential. In Ethiopia soil conservation is usually carried out in conjunction with food aid and food for work programs as a means of manual labor remuneration. This is reflected in Ethiopia's official food aid policy which dictates that no able bodied person should receive food aid without working on a community project in return in hopes this will discourage dependency (Moges and Holden 2007). Ideally this strengthens the local infrastructure (Moges and Holden 2007) but it can also lead to dependency regardless of measures taken by the government to prevent such a relationship.

Health in Ethiopia is a constant issue for development and health organizations. The recurrent drought conditions exacerbate already prevalent diseases such as cholera, malaria, diarrheal disease, and eye infections (Desalegn et al. 2006). The ability of Ethiopians to recover from illness is limited as even after a good harvest they do not consume the recommended daily amount of calories (Tefera 2004) and illness can obliterate gains made after a drought (Little et al. 2006). However health does not make up for a lack of technology in terms of agricultural productivity (Croppenstedt and Muller 2000).

Drought often results in famine and hunger because the subsistence nature of Ethiopian livelihoods (Bekele 2004). As discussed before even though almost eighty-five per cent of Ethiopians are engaged in farming

(Makombe et al. 2007) and eighty per cent of food is consumed on-farm (Tefera 2004), ten per cent of the population received food aid (Makombe et al. 2007), and in fact Ethiopia is the largest recipient of food aid in Africa (Moges and Holden 2007). Recent studies show that seventy-eight per cent of the needy in Ethiopia do not receive (Tefera 2004) but according to (Quisumbing 2003) food aid is well targeted. This shows the discrepancy between what pictures government data and independent data draw regarding Ethiopians' well-being. Asset poor dive below the poverty line much earlier than asset rich but food aid comes at the same time making the recovery time for the asset poor much longer if at all (Little et al. 2002). The asset poor need prolonged aid because the current system pulls aid while they are still in poverty. Consequently, poor much more active in buying livestock because their own herd died during the drought or they were forced to sell their stock and cannot rely on breeding to replenish their numbers (Little et al. 2004). It should be noted that those asset poor individuals that received aid from wealthy kin or via other social networks had a much more rapid recovery (Little et al. 2004). The Government provides cereals, powdered milk, oil, and clothing (Desalegn et al. 2006) to those who demonstrate a need which may promote vulnerability by compelling a community to look for handouts but financial and marketing services can decrease this vulnerability and the small quantities and irregularity of help reduce likelihood of dependency (Moges and Holden 2007).

Drought in the short-term is extremely devastating for Ethiopia's citizens but mid-term, because the chronic poverty of the country, overall poverty does not increase (Little et al. 2004). Many efforts have been made to develop an early warning system to help dampen the effects of drought and prepare for harsh conditions but to date the best predictor of drought comes from the El Nino-Southern Oscillation, a weather pattern in the northern hemisphere (Korecha and Barnston 2007). By observing this weather phenomenon drought can be predicted, not absolutely of course, approximately two months (Korecha and Barnston 2007) in advance. This may or may not provide the time necessary for aid agencies to organize their resources to provide food aid early enough to protect household assets.

There have been five food crises since 1980 (Desalegn et al. 2006) and a fivefold increase in the amount of aid during the fifteen year period from 1979-1980 to 1993-1994 (Tefera 2004). Looking at data from 190 to 1996 there have been twenty five episodes of food shortages, famine, and drought resulting in 1.2 million deaths and effecting over 60.8 million people in Ethiopia alone (Desalegn et al. 2006). This is due in part to policy constraints forced upon Ethiopians. The small land holdings designated to

each household reduce individual access to farm land (Ezra and Kiros 2001) as there is only so much land and there is a continued increase in population and the push to expand small-scale irrigation and watershed management are key in food insecurity (Devereux 2000). Additionally, the ethnic regionalism places certain restrictions on mobility limiting the type and location of off-farm employment available to individuals. One policy adjustment that may be useful in ensuring the proper targeting of may be the establishment of a regional state Food Security Coordination office (Tefera 2004).

Recovery is often cut short b the next drought and the threat of drought inhibits investment in productivity which means marginal farmers are often forgoing inputs that would enhance their crop because the risk of crop failure due to drought is too great (Devereux 2000).

Drought mitigation is a natural part of existence in Ethiopia and requires individuals, households, and communities to take action in advance to reduce long-term risk. Ideally, these mitigation actions should come in the form of policies, programs, plans, and activities (Desalegn et al. 2006), but needs at the local level do not necessarily translate into policy at the national level. Subsequently, Ethiopia has failed to achieve effective drought proofing (Tefera 2004).

For many households migration is the first method of solving food shortages, except for those close to town who have the means to buy food (Abule et al. 2005). With no credit many households' only option is to send a young male out to work as a day laborer in exchange for food, grain, or cash (Bekele 2004) and often they send any money they make back home (Desalegn et al. 2006). This can be through Government food for work programs, on other, more well off, farms, in industry, in urban centers, or irrigation projects (Desalegn et al. 2006). Twenty-five per cent of household in the Amhara region (Tefera 2004) had one or more members of the family migrate during the dry season to work. This is often seen as a normal process in rural farm life, with chronic food shortages, and is reflective of community vulnerability as well as individual vulnerability (Ezra and Kiros 2001). Other off-farm activities used to mitigate the losses from drought include charcoal and firewood (Abule et al. 2005). It should also be noted that the same percentage of farmers utilizing irrigation must seek out off-farm employment as those farmers who rely on rain-fed agriculture (Makombe et al. 2007), suggesting that irrigation may not be an area that on which development agencies should focus their attention.

There are other more short-term coping mechanisms which include credit services, past savings, sale of assets (livestock and their products),

trees, and change in livelihood strategies (Desalegn et al. 2006); however, five per cent of those in rain-fed agriculture have no coping mechanism.

Initiatives—Success or Failure

Even if policies and projects are well designed if they lack good implementation at the microlevel then they often miss their target population (Bekele 2004). This requires that project directors and participants look at how multiple interventions can complement each other (Bekele 2004) and particular attention should be paid to local social and political norms, indigenous knowledge, and incorporation of locals in the project.

The likelihood of development initiatives being adopted or sustained after the project team has left a site should be assessed prior to the implementation of said project. The use of economic tools as part of an integrated resource management approach is also important (Desalegn et al. 2006) as the socio-economic condition of a target population may limit the acceptance or willingness to maintain project objectives (Desalegn et al. 2006) particularly if they see an issue as something for which the government or industry should be responsible (i.e. water pollution, air pollution).

Initiatives that fail to use farmers' perceptions, socio-economic factors, and indigenous knowledge often fail or result in disappointing outcomes (Moges and Holden 2007), as they design projects that farmers are less likely to buy into or adopt. Farmers' perceptions on grain yield and marketability of a product (Negatu and Parikh 1999) are the two most important factors in adoption, and income and proximity to town influence perception of marketability. Farm size and income also influence adoption decisions of a given process or practice. Diffusion of information is also important to the respectability of farmers to a particular project. Increased diffusion of info about available technological options for soil conservation had a significant effect on percept of erosion problems in the study area (Shiferaw and Holden 1998) and adoption of conservations increased with recognition of erosion problems (Shiferaw and Holden 1998). Adoption also increased with slope and area of land, availability of information, an increase of land to man ratio, and anticipation of higher returns with conservation (Shiferaw and Holden 1998).

Every project must consider the benefit versus the cost of a given project to both the community and the government, the nature of the resource, character of the community, relationship between the community and resources, external environment, external organizations and programs, and access to markets (Gebremedhin et al. 2004).

At this point it would be prudent to mention many tools that incorporate many of the principles listed above. First and foremost a summary of any project or initiative should be provided to the local people in their own language (Ervin 2004) in such a way that they can understand what the project entails and what if any the effect will be on their community, positive and/or negative).

To better facilitate the adoption of new technology or methods introduced in an initiative, researchers and development agents should spend time in the community, as participant observers, leaning how the interplay between environmental and community activities will affect the perception of such an initiative and its subsequent adoption, as previously mentioned. Often there are several factors involved in how local perceive help from the outside, particularly their relationship with their own government, and how they perceive a given initiative and its future role in the community. For example, irrigation schemes have become the prominent focus of many development agencies since the late 1980s but studies on farmers' desires for farm aid and development have failed to produce results that would support such an overwhelming push for irrigation schemes. In fact, farmers overwhelmingly have failed to mention irrigation as an issue or even mentioned it as a possible avenue for correcting water shortages after the rainy season.

Another, particularly insightful and important, tool for applied anthropologist is the impact assessment. An impact assessment allows scientists from several areas collaborate to predict the short- and long-term effects of a given initiative. This would provide those individuals implementing various initiatives a foundation for comparing the cost and benefits for all parties—locals, government, wildlife, etc. This would also be useful in determining of the short term benefits out way the long term costs. For example, had project managers conducted an impact assessment, or they may have and opted to ignore the results due to pressure from commercial farming industry, they may have decided to forgo extensive irrigation in Tigray, as the cost to desalinate the area is roughly $52 million (Kebede 2008).

After assessments are complete it is important to inform not only the individuals pushing the project and the government, in many cases one-in-the-same, but the locals where the project is being designed. It is important to involve local communities in as many of the development stages as possible. This will increase their likelihood of accepting the project and maintaining the initiative's goals, which would be exponentially likely if the project was designed with the help of local people as the goals should reflect the needs of

both the community and the develop agency. This report should be published in the local language, be brief, and use simple language to accommodate the reading and understanding levels or a diverse population.

Ultimately the goal of development in Ethiopia and in general should be the development or adjustment of policy. Due to certain government influences and the history of the country policy changes are not necessarily feasible but development agents should be aware that until policy changes are made these projects will remain the efforts of outsiders and locals on a very small scale.

Conclusion

Ethiopia is a country characterized by paradoxes. Eighty-five percent of the population engages in subsistence farming yet Ethiopia is the largest recipient of food aid in Africa. Ethiopia is abundant in water resources but the people regularly experience drought conditions every other year. These paradoxes contribute to the economic disparity and poverty prevalent in the country and are often the springboard for various development agencies and initiatives that often work with a top down approach and rarely consider the needs and desires of the local populations that they proclaim to help. As this paper has discussed many of the initiatives have failed to account for the desires or utilize the knowledge of local communities; this has resulted in the failure of many projects and wasted resources that, in many cases, would have been much more efficiently used by local people with the help of project developers. Irrigation, water concerns, and agricultural productivity have a profound effect on the amount of food aid needed by the country and the health of its citizens. Subsequently, these three factors are very negatively affected by the government policies.

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