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Methodological and Ideological Options

The tragedy of bird scaring

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ABSTRACT

This paper examines crop raids by birds in semi-arid Kenya, highlighting the importance of bird scaring as a barrier to the greater adoption of drought-resilient, High Value Traditional Crops (HVTCs) in the region. Using survey data from Tharaka-Nithi County, we find 100% of millet and sorghum farmers in the study area scare birds from their plot, devoting 43–66% of all labour time to this activity when these crops are grown in monocrop plots and 24–47% of labour time in plots where millet and sorghum are grown in combination with other crops. This labour allocation is in stark contrast to farmers of all other crops who dedicate almost no time to bird scaring. Individually scaring birds from their plot, farmers achieve a 'momentary Pareto optimal', perpetuating a 'ripple effect' whereby the negative cost of birds are continuously shifted from one farmer to the next. We systematically examine this cost-shifting behaviour as an externality, theoretically applying environmental and resource economics (ERE) policy prescriptions for externality internalisation. ERE, however, with its focus on self-interest, rational actors and technological interventions, falls short to present effective solutions to this so-called externality. Farmers in the region can address crop raids by birds through collective, coordinated action. At this scale, the negative cost of pests is deliberately distributed across all receptors, leading to long-term, community-wide social wellbeing improvements.

1. Introduction

In some regions of Africa, 90% of farmers report crop loss to wildlife (Hill, 1997). In particular, bird crop raids are usual events in many agricultural areas of Africa, requiring farmers to sit and invigilate their lands for long hours — an endless, isolating and debilitating process that presents an important challenge for socio-economic development and food security at the household level. In general, efforts have been devoted to minimize human-wildlife conflict by examining compensatory schemes to crop losses (Rollins and Briggs, 1996; Wagner et al., 1997; Tassell et al., 1999; Osborn and Park, 2002; Bulte and Rondeau, 2007; Gubbi, 2012), or developing technologies to reduce crop raids (Mallamaire, 1961; Lenné, 2000). In Wisconsin, for instance, residents are compensated for the loss of livestock, pets and hunting dogs (among others) to wolves (Agarwala et al., 2010). A similar scheme in Kenya's Amboseli National Park compensates pastoralists for goats and cows lost to elephants (Bulte and Rondeau, 2005). Very few studies, however, examine labour allocation to pest management at the community level and, even though pest control is inherently a 'social problem' (Norgaard, 1976), the role of collective action and coordination remains poorly understood.

We collect and analyse smallholder agro-economic data from Tharaka-Nithi County in semi-arid Kenya with the goal of understanding farmers' labour allocation to bird scaring and improving household food security in the region. Comparing plot-level inputs and outputs for a variety of crops, we identify bird scaring as an outlier labour input for farmers of millet and sorghum — drought-resilient, High Value Traditional Crops (HVTCs). Beyond identifying the problem itself, farmers' self-interested behaviour vis-à-vis this challenge provides great insight into economic theory and the way we address natural ecological phenomena. With little or no community-level coordination, farmers act in isolation to evict birds from their plot, continuously shifting the negative cost of pests to their neighbour. We examine this behaviour as an externality, testing and theoretically applying environmental and resource economic (ERE) prescriptions for the internalisation of negative externalities in search of a socio-economically efficient and effective outcome. At the core of ERE's internalisation efforts is the notion that actors engaging in a transaction behave as rational economic agents who only aim at maximizing utility at the individual level, spurring in turn social wellbeing improvements (Varoufakis, 1998). Exhausting ERE's prescriptions, we side with an alternative body of literature which describes externalities as 'cost-shifting practices' (Kapp, 1969; Martinez-Alier, 2002), whereby farmers are characterised as bearers of 'plural rationalities', sometimes making decisions individually and at other times collectively (Temper and Martinez-Alier, 2013). Within this alternative framework, we present a collective-action

Abbreviations: AEZ, Agro-Ecological Zone; ERE, Environmental and Resource Economics; FAO, Food and Agriculture Organization of the United Nations; FFS, Farmer Field School; HVTC, High Value Traditional Crop; KARI, Kenya Agricultural Research Institute; LM4, Lower-Midlands 4; LM5, Lower-Midlands 5; FFS, Farmer Field School; MOA, Kenyan Ministry of Agriculture, Livestock and Fisheries; PAC, Problem Animal Control; SD, Standard Deviation.

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based approach to externalities whereby costs are deliberately distributed among all actors, allowing for community-wide social wellbeing improvement.

This paper begins with a brief overview of the existing literature on crop loss to birds in Africa. Subsequently, Section 3 outlines the study site and methodology. In Section 4, data is presented on effort and time expenditure dedicated to different agricultural activities per cropping system in semi-arid Kenya, highlighting the disproportionate role of bird scaring as a labour input for farmers of certain crops. Section 5 critically examines externality theory, theoretically applying and comparing ERE solutions to bird scaring for poor farmers in semi-arid Kenya. Finally, Section 6 presents a collective action based approach to ecological externalities.

2. Pests and Smallholders

Agriculture in Kenya is dominated by small-scale farmers,[1] accounting for 65% of total agricultural production (Poulton and Kanyinga, 2013) and 51% of the labour force in the sector (Alila and Atieno, 2006). In Kenya, as in many parts of Africa, crop losses attributed to wildlife and pests are a costly and unending struggle for smallholder farmers. Examining bean and maize production in highland areas of Kenya, Grisley (1997) estimates 42 and 57%, respectively, of all crop production is lost to pests (Grisley, 1997). In semi-arid regions, Songa and Songa (1996) find supporting evidence of this significant loss through a study of maize production, finding infestation and damage by pests to be the third largest constraint on production after soil fertility and moisture stress (Songa and Songa, 1996).

Throughout many agricultural lands in Africa, bird crop raids are continuous events. In a study of crop damage by vertebrates in Uganda, for example, Hill (1997) describes birds as "major perpetrators of crop-raiding", with 32% of farmers in the study area reporting crop raids by birds (Hill, 1997). Bird raids are more common if the land is dedicated to the production of rice or drought-resilient, High Value Traditional Crop (HVTC) cereals such as sorghum and millet which are of preference to Western Kenya's migratory red-billed *Quelea* (Mallamaire, 1961; Ruelle and Bruggers, 1982; Manikowski, 1984; Hill, 1997; FAO and WFP, 2009; Esipisu, 2013; One Acre Fund, 2013). Varieties of millet and sorghum seeds are of such preference to birds they are commonly used as wild bird feed in North America and Europe (Anderson and Martin, 1949; FAO, 2005). HVTCs are indigenous crops adapted to the extreme soil and climatic conditions of semi-arid Africa, compatible with the agro-ecological and socio-economic conditions of the area. In a 'bad season', HVTCs outperform cash crops as they offer adaptation to extreme soil and climatic conditions, are known to do well in dry conditions and can survive the unpredictable weather patterns and increasing aridity brought about by climate change (Muthoni and Nyamongo, 2010). Given birds' preference for HVTCs, crop raids by birds represent a significant barrier to the greater adoption of these 'climate-smart', (FAO, 2013; Government of the Republic of Kenya, 2013) drought-resilient crops. Despite the importance of HVTCs and Kenyan Government support for their wider adoption (Maina et al., 2013), crop raids and smallholder labour allocation to bird scaring remain poorly understood due to limited research effort and funding (Government of the Republic of Kenya, 2013).

Widely recognised a principle bird pest in Africa, the red-billed *Quelea* is described as "… one of the most notorious pest bird species in the world" (de Mey et al., 2012: p178). Travelling in flocks of hundreds, *Queleas* descend rapidly on farmers' plots during the 'milky' crop maturation phase (Mallamaire, 1961; Elliott, 1979; Ruelle and Bruggers, 1982; Esipisu, 2013), quickly "turning a promising harvest into a barren field" (One Acre Fund, 2013). Exact crop damage inflicted by *Queleas* is difficult to quantify due to insufficient statistical data (Mallamaire, 1961) and the challenges associated with attributing crop loss directly to one species. Surveying the available literature of cereal crop loss to all birds in Africa, de Mey et al. (2012) estimate an average 15–20% loss, with the red-billed *Quelea* the main pest species reported (de Mey et al., 2012). Later, focusing specifically on rice production in the Senegal River Valley, de Mey et al.'s study estimates a 13.2% annual bird damage during the wet seasons of 2003–2007 — this constitutes an average annual economic loss of 4.7 billion CFA francs (USD$9.8 m) (de Mey et al., 2012).

Crop raids require farmers to sit and invigilate their lands for long hours (Manikowski, 1988), leading to boredom and a sense of social isolation (Ejiogu and Okoli, 2012). In a seven year study of traditional crop protection methods in Africa, Ruelle and Bruggers (1982) note: "Bird scarers usually are positioned in the middle of a field, often on a platform from where they shout, throw rocks or plant stems, and crack whips or rattle cans as birds enter the field" (Ruelle and Bruggers, 1982: p80). In one Gambian study reported by Ruelle and Bruggers, loss to birds ranged from 17 to 38% for farmers not conducting any bird scaring (Ruelle and Bruggers, 1982). Studying sorghum fields in Chad, DaCamara-Smeets and Manikoski (1975) find farmers who guard their fields suffer a loss of 4%, compared to a 35% loss for unguarded fields (DaCamara-Smeets and Manikoski, 1975). In addition to human scare actions, some farmers choose to erect nets (Manikowski, 1988), scarecrows or hang obsolete compact discs (Esipisu, 2013) and videotape around the field to deter birds from their plot (One Acre Fund, 2013). Farmers often employ their own household members to scare birds, including children (Katz, 1986, 1991; Bass, 2004; Ejiogu and Okoli, 2012) because they are inexpensive (Ruelle and Bruggers, 1982). This labour allocation highlights the significant (and often neglected) opportunity cost associated with bird scaring and pest management more generally (Chambers et al., 2010). Short-term agriculture and household food security is often prioritised at the expense of non-income generating activities, such as education and play (Hollos, 2002; Ejiogu and Okoli, 2012). Conversely, if farmers allocate their own labour time to bird scaring or choose to hire outside help, fewer resources are available for 'next best' income generating or social activities (Chambers et al., 2010).

3. Study Site and Methodology

The study was conducted in Tharaka-Nithi County. Surveys were conducted in three locations (administrative regions): Chiakariga, Matiri and Nkarini. The general characteristics of each location are outlined in Table 1.

Chiakariga, Matiri and Nkarini were selected because of their close proximity to market (Nairobi), each other and because the two main Agro-Ecological Zones of Kenya, Lower-Midlands 4 (LM4) and Lower-Midlands 5 (LM5), are fully represented. An Agro-Ecological Zone is a "… land resources mapping unit, defined in terms of climatic, landform and soils, land cover and having specific potentials and constraints for land use" (FAO, n.d.). Both LM4 and LM5 are characterised by upland, low fertility soils, requiring an intensive supply of manure and fertilizer each season. Furthermore, both AEZs have biannual mode of rainfall, namely short rains (October, November and December) and long rains (March, April and May), with the LM4 zone receiving a higher annual mean rainfall. Across Chiakariga, Matiri and Nkarini, six villages were selected: three in the LM4 AEZ and three in the LM5 AEZ.

Within each village, a representative number of households were sampled equivalent to 30% of the entire population per village, leading to 80 households sampled in total. The survey, conducted in June 2012, compared cost and labour inputs with outputs (see Table 2) between distinct cropping systems at the household level during a perceived 'good season', one characterised by ample precipitation leading to a plentiful harvest and a perceived 'bad season', where minimal rainfall resulted in the prevalence of high crop failure, so as to understand

[1] Small-scale farmers are defined as those with between 0.2 and 3 ha for subsistence and commercial purposes (Government of the Republic of Kenya, 2010).