November 12, 2015

Mr. Christopher Grundler
Director, Office of Transportation and Air Quality
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Submitted via regulations.gov

Comments from ActionAid USA, Clean Air Task Force, Environmental Working Group, and National Wildlife Federation on the Environmental Protection Agency's Notice of Opportunity to Comment on an Analysis of the Greenhouse Gas Emissions Attributable to Production and Transport of Jatropha Curcas Oil for Use in Biofuel Production
80 Federal Register 197 (October 13, 2015); EPA–HQ–OAR–2015–0293; FRL–9935–46– OAR

Dear Mr. Grundler:

As national environmental and development organizations, we are pleased to provide joint comments on the Environmental Protection Agency's (EPA) Docket No. EPA–HQ–OAR–2015–0293 "Notice of Opportunity to Comment on an Analysis of the Greenhouse Gas Emissions Attributable to Production and Transport of Jatropha Curcas Oil for Use in Biofuel Production" (referred to hereinafter as EPA's "proposal," "proposed analysis," or "proposed ruling") that was published in the Federal Register at 80 Fed. Reg. 197 on October 13, 2015. Representing millions of members, our groups share a focus on fighting global warming, protecting human health, preserving natural habitats, and advocating for clean energy. We believe that EPA's assessment of the lifecycle greenhouse gas emissions (GHG) of *Jatropha curcas*'s ("jatropha") use in biofuel production is critical to achieving these goals. Our comments address not only EPA's GHG analysis of biofuels from jatropha oil, but other issues identified in the notice as well, including the following: (1) EPA's approach comparing the GHG analysis of soybean oil to jatropha oil; (2) jatropha's GHG emissions and related direct and indirect land use change; (3) land rights and impacts on food security and water availability; and (4) the potential for jatropha to become an invasive species.

[I] Summary of Comments

These comments address several reasons why EPA's proposed ruling fails to fully account for the lifecycle greenhouse gas (GHG) emissions of jatropha's use in biofuels production. First, it is not clear that some of the key comparisons that EPA makes between jatropha oil and soybean oil are warranted, calling into question EPA's reliance in this proposal on the findings it made while analyzing GHG emissions from biofuels produced from soybean oil. Second, the proposal fails to fully account for lifecycle GHG emissions arising from direct and indirect land use change associated with jatropha production. Third, and related to the underestimated land use change, is the negative impact on land rights, water, food security, and the environment in the areas the EPA identified for jatropha feedstock development. Last but not least, jatropha's potential to become an invasive species should also be more fully assessed.

[II] EPA's Approach Comparing the GHG Analysis of Soybean Oil to Jatropha Oil

When it passed the Energy Independence and Security Act (EISA) of 2007, Congress drastically expanded the Renewable Fuel Standard (RFS) mandate, largely by establishing aggressive mandates for "advanced biofuels." To date, however, the RFS has largely amounted to a mandate for corn ethanol, a fuel that negatively impacts climate change, water quality, wildlife habitat, and international food security. Corn ethanol has accounted for almost 90% of the fuel by volume that has been produced under the RFS from 2010-2014. Combined with the slow development of cellulosic biofuels (required to reduce lifecycle GHG emissions by at least 60% as compared to petroleum-based fuels) and other advanced biofuels (required to reduce GHG emissions by at least 50%), the RFS is unlikely to meaningfully contribute to climate change mitigation until the policy supplies consumers with less corn ethanol and more true advanced biofuels. EPA is charged with determining whether biofuels meet the 50% lifecycle GHG reduction threshold, and the Agency recently developed a process for streamlining its analysis of new "advanced biofuel" pathways.[1]

Under EPA's proposal, biofuel made from jatropha, an oilseed crop grown in tropical and sub-tropical regions, would qualify as an "advanced biofuel." The proposed jatropha determination relies heavily on findings that EPA made in its previous analysis of soybean oil, specifically that the GHG emissions attributable to soybean oil-based biofuel are at least 50% lower than those from petroleum-based diesel. As EPA states in its proposal, "on average the GHG emissions attributable to jatropha oil extracted from jatropha seeds grown on unused grasslands in southern Mexico are 951 kilograms of carbon dioxide equivalent emissions (kg CO2e) per tonne of jatropha oil…, compared to 1,425 kg CO2e per tonne of delivered soybean oil;" and "in both… analyses the GHG emissions attributable to the production of jatropha oil are much lower than the corresponding emissions for soybean oil."[2]

Based on the information presented in EPA's proposal, however, it is not clear that soybean production is an appropriate analogue for jatropha production, or that EPA's comparison between the two is warranted. Stark differences between the two crops are evident (for instance, their location of production - see section III.A. below for more information). A 2013 report by the UN Committee on World Food Security's (CFS) High Level Panel of Experts (HLPE) on Food Security and Nutrition (referred to as the "2013 CFS HLPE report") also estimated that jatropha's land use intensity is higher than biodiesel produced from soybean oil.[3] EPA's related assumptions about certain aspects of the jatropha's production are also highly uncertain (see production yields and inputs section below for more information). If there are uncertainties in the production of crops such as jatropha, full and updated lifecycle GHG analyses must be completed to reflect real-world conditions rather than relying on previous analyses of established feedstocks such as soybean oil. Otherwise, EPA's analyses may fail to account for real-world production practices, land use change, and associated GHG emissions, meaning RFS-approved biofuels (advanced biofuels in this case) would fail to achieve the GHG reduction thresholds set forth in EISA.

[III] Jatropha's GHG Emissions and Related Direct and Indirect Land Use Change

With passage of EISA, EPA is required to include GHG emissions from direct and indirect land use change in its analysis of new biofuels pathways. While jatropha production is not expected to result in large land use changes, even small changes, once summed up, can have a detrimental impact on our climate, water, air, soil, food security, and wildlife resources. We understand the difficulty in calculating GHG emissions from biomass production, but as history has shown, scaling up biofuels production can result in numerous unintended consequences. As EPA noted in its proposal, research on the lifecycle GHG impacts of jatropha in particular are largely still uncertain given the crop's limited production history to date. The following sections discuss other important issues that EPA should consider when finalizing its

GHG analysis of jatropha, including the following: (1) the location of future jatropha production (that will then be exported to the U.S.); (2) likely land use change scenarios and their impact on lifecycle GHG emissions; (3) likely future production yield and input scenarios; (4) EPA's assumptions about yield elasticity responses and future global food consumption; and (5) whether or not increased jatropha production will result in unbroken land being brought into biofuels feedstock production, potentially violating a key provision of EISA – the definition of "renewable biomass."

[A] Location of Jatropha Production and Its Impact on Jatropha's GHG Analysis

EPA assumes that jatropha oil exported to the U.S. for RFS-compliant biofuels will only originate from Mexico and/or Brazil, stating that "while there is potential for jatropha cultivation in India and Africa, it remains uncertain whether jatropha oil grown in those locations would be exported to the United States..."[4] However, production in Africa, Asia, and other locations has already been touted by industry officials, and past production in these countries has also been reported by the Food and Agriculture Organization of the United Nations (FAO). At least one company, Plant Oil Powered Diesel Fuel Systems, Inc. - a petitioner for the use of neat jatropha oil as a transportation fuel in the RFS - touts India as "the only country that has established commercial scale cultivation of jatropha trees;" in addition, the company identifies suitable land for jatropha production in a map of Africa on its website.[5] FAO estimates that in 2015, the "largest [jatropha-] producing country in Asia will be Indonesia. In Africa, Ghana and Madagascar will be the largest producers, [and] in Latin America it will be Brazil."[6] Particularly as the EPA is considering jatropha cultivation with commercial inputs, such as fertilizer and irrigated water on agricultural lands, there will be incentives to try to establish commercial production even in areas where previous attempts without those inputs have failed.

Production in other parts of the world would result in different GHG emission profiles and impacts on land use change and food security. For example, if jatropha production displaced forests or wetlands, the land use change emissions would be significantly higher. And expanding production in climates less suited to jatropha production would result in higher inputs and greater emissions from feedstock production (for example through increased use of fertilizer and/or irrigated water). Achten *et al*. (2007) also note that the distance to markets is "expected to have a significant impact on the GHG balance"[7] of jatropha biofuels.

EPA must also adequately estimate where likely jatropha oil exports to the U.S. will originate from and the land uses on which this jatropha production will take place if the Agency is to fully take GHG emissions from direct and indirect land use change into account when finalizing its analysis. As EPA notes in Table III-8 of its proposal, GHG emissions from land use change in the rest of the world will increase, not decrease, with greater jatropha production.[8] But this depends greatly on where the production is likely to occur. EPA fails to provide adequate information to justify one of its major assumptions in its two-country scenario that exports to the U.S. will only originate from Mexico and Brazil in equal quantities each and every year.

Furthermore, EPA's determination that jatropha biofuels would reduce GHG emissions by 50% or more in its two-country analysis wholly depends on the inclusion of Mexican jatropha production (specifically, by averaging land use GHG emissions from both Brazil and Mexico, assuming equal exports), which is fraught with its own set of problems (see section on yield elasticity in particular). To illustrate, in its unused grasslands scenario, EPA takes a simple average of GHG emissions from jatropha production in Mexico and Brazil:

> Estimating "that on average the GHG emissions attributable to jatropha oil extracted from jatropha seeds grown on unused grasslands in southern Mexico are 951 kilograms of carbon dioxide-equivalent emissions (kg CO2e) per tonne of jatropha oil…, compared to 1,425 kg CO2e per tonne of delivered soybean oil. If jatropha is grown on grassland in northeastern Brazil that would not otherwise have been used for crop production or grazing, we estimate that the GHG emissions would be 1,858 kg CO2e per tonne of delivered jatropha oil... [and in conclusion, EPA estimates] 1,404 kg CO2e per tonne of delivered jatropha oil [by taking the simple average of the two figures for Brazil and Mexico], which is lower than the emissions attributable to delivered soybean oil."[1]

If EPA had rather assumed that only Brazilian production would be exported to the U.S., land use change emissions in both Brazil and the rest of the world are expected to increase—rather than decrease, as is the case with EPA's assumption of equal production levels in Brazil and Mexico. Hence, if exports only originated from Brazil, jatropha biofuel would fail to reduce GHG emissions by 50% and qualify as an "advanced biofuel" under the RFS. There is a significant likelihood that jatropha exports from Brazil to the U.S. will exceed those from Mexico, given Brazil's world class capabilities as a biofuel producer and the extensive track record of biofuel-related trade between Brazil and the U.S. This illustrates the importance of making realistic assumptions about the likely location of future jatropha production (and subsequent exports to the U.S.) or else jatropha biofuels will fail to actually reduce GHG emissions by at least 50%, as required by EISA (see next section for more information).

[B] Type of Land Use, Carbon Stocks, and GHG Emission Reductions

Despite limited information, in its first scenario, EPA assumes that all jatropha exported to the U.S. for use in the RFS will be grown on *unused* grasslands in Mexico and Brazil, thus resulting in limited land use change from additional acres being brought into agricultural production. However, the Agency failed to cite adequate evidence to validate its assumption that adequate hectares of unused grasslands (that nonetheless qualify as "agricultural land" per section 211(o)(1)(I)(i) of the Clean Air Act) would be available for jatropha production and that land currently in agricultural production would not be used for jatropha production (in addition to its faulty assumption that exports would only originate from Brazil and Mexico, as noted above). This provides a cause for concern.

First, grasslands are often relied on by local communities for income generation, fuel, and food. Just because grasslands are not agricultural land does not mean they are unused. Second, there are environmental risks to displacing grasslands. Some of the specific states mentioned in Mexico have very little agricultural land already (as Oxacaca is primarily mountainous) and are critical habitats for biodiversity. The grasslands in the specified area of North East Brazil would likely be part the Caatinga. The Caatinga is a unique biome of shrub land and thorn forests that has already suffered considerable degradation. Since it is almost entirely unprotected, there is a serious risk that expanded jatropha production would further degrade this area. In fact, the U.S. Agency for International Development (USAID) has over 80 projects in the Caatinga, the Atlantic Forests, and the Cerrado areas in Brazil devoted to preserving those environments and sustainable development for local communities, because of the already present risks to these areas.[9]

Several researchers have also questioned whether jatropha could meet the 50% GHG reduction threshold for advanced biofuels set forth in the RFS, given the land use types on which jatropha is likely to be grown and its resulting impacts on displacement of other food and feed production. Xunmin *et al*. (2009) estimate a jatropha GHG reduction of 49%, which fails to meet the 50% threshold.[10] Almeida *et* *al*. (2011) estimate that jatropha biodiesel "reduces greenhouse gas emissions by 51%," but GHG emissions from land use change are absent from their analysis.[11] The 2013 CFS HLPE report estimated that jatropha may reduce GHG emissions by 40–100% (as compared to diesel), but again, land use change emissions were not accounted for. In the one major study where direct land use change emissions were analyzed, Bailis and Baka (2010) estimated average emissions due to land conversion in Brazil's Northern Minas Gerais of 40 kg CO2e per GJ of jatropha jet fuel produced, a 55% reduction relative to conventional jet fuel. However, as the authors note,

> "[direct land use change] based on observations of land-use transitions leads to widely varying changes in carbon stocks ranging from losses in excess of 50 tons of carbon per hectare when Jatropha is planted in native cerrado woodlands to gains of 10−15 tons of carbon per hectare when Jatropha is planted in former agro-pastoral land. Thus, aggregate emissions vary from a low of 13 kg CO2e per GJ when Jatropha is planted in former agro-pastoral lands, an 85% decrease from the reference scenario, to 141 kg CO2e per GJ when Jatropha is planted in cerrado woodlands, a 60% increase over the reference scenario… If… [natural grasslands] are converted to Jatropha, there may be a net loss of carbon [resulting in only a 36% decrease in emissions from conventional jet fuel]… [I]f native vegetation consists of shrubland, which was observed during fieldwork… conversion to Jatropha results in a large carbon debt, which negates the benefits of fossil fuel replacement over the 20-30 year project lifetimes examined in this study... [Conversion of] dry-zone and moist-zone forest result[s] in emission increases that are 3-4 times larger than emissions from conventional jet fuel."[12]

This research stresses the importance of adequately modeling where jatropha may be planted and how different types of land use conversion can either greatly decrease or increase GHG emissions. Numerous other research studies have challenged EPA's findings that jatropha could reduce lifecycle GHG emissions by at least 50%:

- Bailis and Baka (2010) mentioned separate research in their Brazil study which found carbon stock losses of jatropha plantations in both South India and Tanzania.[13]
- Achten *et al*. (2007) noted that "GHG balance is expected to be much dependent on the type of land use which is converted to J. curcas. Removing natural forest will have a severe impact on the global warming potential of the jatropha biodiesel."[14]
- Achten and Verchot (2011) found that carbon repayment from jatropha production in Ghana, Zambia, and Mexico (which included both direct and indirect land use change emissions) could take 76–310 years, and jatropha's carbon debts were higher than those from soybeans.[15]
- Achten (2013) found that carbon debt from "conversion of forests cannot be repaid within one human generation. Repayment of carbon debt from shrubland conversions in 30 years is challenging, but feasible. Repayment in 15 years is currently not attainable."[16]
- Romijn's (2011) research on large-scale jatropha production on African Miombo Woodlands found that "jatropha can help sequester atmospheric carbon when grown on complete wastelands and in severely degraded conditions. Conversely, when introduced on tropical woodlands with substantial biomass and medium/high organic soil carbon content, jatropha will induce significant emissions that offset any GHG savings from the rest of the biofuel production chain."[17]

At least one company - Plant Oil Powered Diesel Fuel Systems, Inc. – notes that it "avoids cutting down forests and displacing existing cropland to plant jatropha trees. Instead, small-scale farmers plant on their own, fallow land or on land that is naturally savannah grass or scrub-land."[18] Even here there is evidence of scrubland and other carbon-rich land already being converted into jatropha plantations, highlighting the need for EPA to fully account for these GHG emissions associated with land use change in its final analysis of jatropha-based biofuels (in addition to analyzing whether jatropha is meeting the RFS's definition of "renewable biomass" – see section on aggregate compliance below for more information). If ignored, GHG emissions savings from jatropha biofuels will be greatly overestimated.

[C] Production Yields and Inputs

EPA's yield estimates for jatropha appear overly generous, particularly when other authors' findings and the crop's limited plantings to date are taken into consideration. EPA assumes jatropha will yield four to five tonnes per hectare. However, in an analysis of jatropha yields in Brazil, Bailis and Baka (2010) assume an average yield of four tonnes per hectare, on the lower end of EPA's analysis.[19] Achten (2013) notes that five tons per hectare "is the current maximum jatropha yield,"[20] and Achten *et al*. (2010) found that jatropha grown on marginal lands may not be economical.[21] Yields in India reported by Gmünder *et al*. (2012) only reached 2-2.6 tonnes per hectare even with irrigation.[22] Yields in other countries, particularly in Africa, may be lower if significant inputs are not applied. The 2013 CFS HLPE report concludes, "while jatropha might have some of the agronomic advantages initially identified, its economic viability demands high productivity levels, which in turn require better varieties, better quality soils and greater water inputs. It provides no ready solution, therefore, to the competition for resources that has been the main source of criticism of first-generation biofuels (Gasparatos *et al*., 2012)."[23]

EPA rightly recognizes that successful jatropha production requires fertilizer, irrigation, and other inputs on more productive agricultural land. EPA acknowledges that "[jatropha] is adapted to marginal lands with low nutrient content, but commercial production has been unsuccessful in these conditions… Therefore… we expect jatropha to be grown by farmers on arable land with the use of fertilizer, pesticides, irrigation where necessary, and other crop inputs,"[24] which is consistent with research by Bailis and Baka (2010) and others.[25] However, EPA largely assumes jatropha will be planted on unused grasslands even though jatropha yields are much higher on better-producing agricultural lands with significant agricultural inputs, which may ultimately result in larger GHG emissions that have not been fully factored into EPA's GHG analysis. Sinha (2013) estimated that carbon emissions increase "from 159 kg CO2e [per hectare] to 2,338 kg CO2e as the fertilizer and irrigation use in Jatropha plantation[s] increase from [scenario] 1 (nil) to [scenario] 4 (220kg/ha), which is similar to other studies."[26] Due to these large fluctuations, EPA's final GHG assessment must reflect likely land use change scenarios and the necessary agricultural inputs required to produce jatropha economically.

[D] Yield Elasticity and Food Consumption

In its proposed analysis, EPA makes inaccurate assumptions about jatropha's lack of indirect impacts on crop and livestock production and overly generous assumptions about yield elasticity responses in developed countries such as the U.S. due to displaced food (specifically corn) production in Mexico, in addition to underestimating future GHG emissions from increased food production as a result of expanded jatropha plantings. These assumptions, which fail to reflect real-world conditions and research from past academic studies, are discussed in turn.

First, EPA assumes in its first scenario that "there are no indirect agricultural sector emissions, such as from indirect impacts on crop or livestock production, because jatropha is not an agricultural commodity, and the displaced land would not otherwise have been used for commodity production."[27] However, even though jatropha is not a traded agricultural commodity, its expansion may still impact the production of other major food and feed crops, especially if it displaces livestock and crop production that cannot be replaced by commensurate yields increases elsewhere. Furthermore, local communities often rely on marginal lands or grasslands for income generation, fuel, and food. So even though it is not "agricultural land," displacing grasslands can be harmful to communities and displace food, feed, and fuel production elsewhere, with impacts on GHG emissions that should be accounted for.

Next, within its second scenario, EPA wrongly assumes that lost corn production due to jatropha expansion in Mexico could be wholly replaced by increased corn yields in the U.S. In its proposed analysis, EPA assumes Mexican land used for jatropha production would originate only from land in current agricultural production, primarily corn but not higher-value crops. As EPA states, "the net GHG emissions in this analysis are negative primarily because jatropha sequesters more carbon than the cropland it displaces [corn fields in Mexico] and the indirect emissions are relatively small because the displaced corn production is backfilled by higher yield producers (e.g., corn production in the United States)."[28]

However, several experts have challenged past yield elasticity projections, especially considering future impacts of climate change and the impact of high crop prices from 2008-2013 which put increased pressure on land use, particularly in the U.S. History has shown that corn yields have failed to keep up with prior projections and increased demand. Therefore, land extensification has occurred instead of simply intensification, particularly since the RFS2 was implemented in the U.S. as yields failed to keep up with increased demand for corn. U.S. Department of Agriculture (USDA) data shows that yields dropped to 123 bushels per acre during the 2012 drought – the lowest since 1995 - despite record corn plantings of 97 million acres,[29] and new acres – largely former pasture, grassland, wetlands, and other sensitive acres – came into production for the first time with huge implications for GHG emissions.[30] This leaves few new acres to be brought into production (without significant impacts on grasslands, wetlands, and other carbon-rich land) if yields continue to fall short of expectations. David Lobell and others also estimated that drought conditions in the U.S. Midwest will negatively affect corn yields over the next 50 years. According to the Lobell *et al*. (2014) study, a greater incidence of midsummer drought conditions will slow the steady improvement in corn yields that farmers have historically achieved by increasing their cropping density, and if corn-growing regions continue to experience hotter and drier Julys, current projections for corn yield improvements are unlikely to be met.[31] This research demonstrates the importance of properly modeling likely yield response scenarios, as inadequate modeling will greatly underestimate GHG emissions from land use change.

Third, EPA assumes that "meat production declines" as jatropha production expands, subsequently resulting in lower land use change emissions.[32] However, for the reasons summarized below, EPA has not provided adequate evidence to justify this assumption nor has it shown that jatropha should be eligible for preferred treatment under the RFS on the basis of GHG savings achieved at the expense of lower global food production and consumption:

- EPA has failed to demonstrate that countries like Mexico will not enact counteracting subsidies in the face of rising food prices that would offset increased RFS demand (but would also lead to more land clearing and higher GHG emissions from indirect land use change). If instead EPA chose to assume that society would limit the extent to which food production (and hence consumption) would decline (especially taking into consideration a growing world population demanding significantly more calories and protein), its GHG analysis would produce different results. Plevin *et al*. (2015)[33] and Hertel *et al*. (2010)[34] estimate that emissions from biofuel expansion would increase significantly if food consumption was held constant instead of an assumed decline. Searchinger and Heimlich (2015) also estimated that "the world needs to close a 70 percent gap between the crop calories that were available in 2006 and the calorie needs anticipated in 2050. During the same period, demand for meat and dairy is projected to grow by more than 80 percent…"[35] Searchinger *et al*. (2015) concluded that an "analysis of the three major models used to set government [biofuels] policies in the United States and Europe suggests that ethanol policies in effect are relying on decreases in food consumption to generate GHG savings."[36]

- EPA's acknowledgement that jatropha cultivation will exacerbate food insecurity calls into question jatropha's fitness for the RFS, given EPA's stated preference for prioritizing non-food feedstocks—a preference that presumably extends to feedstocks that that do not interfere with food markets.[37]

Jatropha was initially promised to be a non-food crop grown on marginal land that would not compete with the food supply, but if it is to be grown on agricultural land otherwise used for food or feed production (as EPA assumes will be the case in at least one of its scenarios) or if EPA makes unrealistic assumptions about food production declining as a result of increased jatropha production, GHG emissions from subsequent land use conversion and/or negative impacts on global food security are likely to be greatly underestimated in EPA's analysis.

Finally, EPA fails to understand the often very local nature of food markets in developing countries. Many people, particularly in rural areas, depend on local food production by smallholder farmers for their food. This is why, despite the large commercial food production in the U.S. and Europe, 80% of the world still depends on smallholders for food. Increased U.S. corn production cannot be assumed to replace lost local production in these areas, particularly for small-holder farmers who could be displaced. There will be demand for local or regional farms to replace lost production there, likely through land conversion. Either way, food insecurity and hunger will result from displaced food production, which eventually impacts land use and GHG emissions elsewhere.

[E] Renewable Biomass Definition and Aggregate Compliance

In its proposal, EPA assumes that all jatropha exported to the U.S. will qualify as "renewable biomass" in the RFS, meaning it will be produced on agricultural lands that were "cleared or cultivated" or "non-forested" before December 19, 2007.[38] However, given the Agency's lack of enforcement and proper implementation of this definition in the past,[39] EPA cannot make a blanket assumption that no unbroken grasslands, wetlands, and other sensitive, carbon-rich lands will be brought into jatropha production without a proper tracking system to prove the Agency's assumptions are accurate in the real world. Again, as EPA states in its proposal,

> "[T]here is uncertainty about whether African jatropha oil production would qualify as renewable biomass, because it is not clear that the land where it would be grown could be considered existing agricultural land, as required in the [Clean Air Act] to qualify as renewable biomass… Although we are specifically modelling jatropha growth and transport in Mexico and Brazil, and expect most jatropha oil used as renewable fuel feedstock for the RFS program to be grown in those countries, we intend to apply our analysis of the GHG emissions attributable to jatropha oil production and transport when evaluating facility specific petitions that propose to use jatropha oil as biofuel feedstock, regardless of the country of origin where their jatropha oil feedstock is grown. In the future, some jatropha oil feedstock used to produce biofuels for the RFS may be sourced from countries other than Mexico and Brazil, but this would be unlikely to

change our overall assessment of the aggregate GHG impacts from growing and transporting jatropha oil."[40]

We agree EPA should question whether all jatropha qualifying under the RFS could meet its definition of renewable biomass, but we question the Agency's assumption that jatropha cultivated in Brazil and Mexico meets the statutory definition of "renewable biomass." Bailis and Baka (2010) found evidence that "some [Brazilian jatropha] growers cleared native vegetation, whereas others displaced food crops."[41] This research contradicts not only EPA's assumptions about the type of land that would be used for jatropha plantations (with implications for GHG emissions), but also the assumption that all land used for jatropha production would have been previously cultivated prior to Dec. 2007, thus violating the definition of renewable biomass in the RFS.[42]

We are also concerned that EPA states that its GHG analysis for jatropha would unlikely change even if the crop is grown in countries other than Mexico and Brazil. At a minimum, the Agency must complete new GHG analyses of jatropha produced in countries other than Mexico and Brazil should they be exported to the U.S. in the future, in addition to developing an adequate tracking system that can disqualify non-renewable biomass feedstocks from the RFS. The Clean Air Act requires EPA to ensure that biofuels used to comply with the RFS are derived from "renewable biomass" grown on "agricultural land cleared or cultivated" prior to Dec. 2007 "that is either actively managed or fallow, and nonforested."[43] EPA will not meet this requirement unless it conducts new GHG emission analyses for any non-negligible volume of jatropha imported from countries other than Brazil and Mexico or else the promised GHG savings in EISA will never come to fruition.

In summary, before making a final determination about whether jatropha-based biofuels qualify as "advanced biofuels" under the RFS, EPA must demonstrate that it has assessed the land use change impacts associated with the production expansion scenarios that are the most likely to occur. EPA has not yet fully demonstrated that jatropha will either only be grown on unused grasslands (resulting in no land use change) or be grown on land previously used for agricultural production with limited impacts on land use and food production (specifically with EPA's flawed assumption that world food production will decline – but not be replaced - as a result of increase jatropha production and land displacement and that all jatropha production will occur on land that was cultivated prior to Dec. 2007).

[IV] Land Rights, Water Availability, and Impacts on Food Security

Any time biofuel feedstocks compete with agricultural land and agricultural inputs (especially water), they will compete with food production and undermine food security. According to the 2013 CFS HLPE report, experience with jatropha production throughout the world but particularly in Asia and Africa has shown that the crop has failed to live up to its expectations as a non-food crop that could be grown on marginal land not otherwise used for food or feed production. The EPA has acknowledged this in one of its scenarios in its proposed analysis by assuming that there will be some commercial production on agricultural land with appropriate inputs such as irrigated water and fertilizer. This reality though means that jatropha production will be in conflict with food security, as it is competing with food production for agricultural inputs including land. The HLPE report discusses this by noting "the experiences with jatropha have shown that any new biomass production for biofuels will induce some form of competition for land and water, which could have an impact on food security."[44] The area of Brazil intended for jatropha production is home to a large population of smallholder farmers. Expanding biofuel production, and increasing demand for agricultural inputs such as land, threatens these smallholder farmers' livelihoods. Mexico already has a history of food security challenges and sometimes even protests related to the price of corn. In 2007, spikes in the cost of corn in Mexico – which were partially tied to increased demand for corn in the U.S. due to the RFS – increased hunger and resulted in street protests. The price of tortillas increased 69% between 2005 and 2011; in 2011 over half of Mexicans suffered some period of food insecurity.[45]

The crop has also failed to increase incomes and otherwise improve people's livelihoods in developing countries, as once promised. These projects often start with promises that communities' land will not be lost and that production will occur on "unused land." However, the land targeted by many feedstock production companies often is already in use by communities—even if it is not in the way that U.S. agriculture would define as "use."[46] The CFS HLPE report found that more than any other biofuel feedstock (including palm oil and sugarcane), jatropha has been responsible for the most international land acquisitions.[47] Both domestic and international land deals (including several abandoned projects) involving jatropha production were identified in at least 18 African countries, as of 2013.[48]

And completely missing from EPA's analysis is an in-depth look at the impact on water, both from an environmental and human rights perspective. Water is critical to local ecosystems, food security, and to basic human health and well-being. Jatropha can survive low water conditions, but it will not thrive and produce commercial oil volumes without water. In the north and northeast parts of Brazil, for example, only 35% of the population has reliable access to clean water.[49] This is a major challenge for smallholder farmers in the area already, as they struggle to access enough water for agriculture. EPA acknowledges that jatropha plantations will likely need irrigation, but it does not fully examine the implications. Irrigation requires energy, and EPA did not fully explain its analysis of what the emissions costs of such activities would be. Even without considering the GHG emissions' impact, the environmental impact from water pollution due to fertilizer runoff could be equally substantial. As for the human costs, water used on jatropha plantations presents an opportunity cost as that water was not used by the local community.

[V] Potential for Jatropha to Become an Invasive Species

The undersigned groups thank the Agency for continuing to consider invasiveness as part of RFS feedstock pathway determinations and particularly for considering invasiveness in the GHG analysis for *Jatropha curcas*. As explained in EPA's proposed analysis, jatropha poses a moderate weed risk potential in the U.S. according to USDA's weed risk assessment (WRA) evaluation. Additionally, the analysis notes that jatropha can regrow from its roots and if a grove of jatropha is abandoned, seeds would still produce.

However, other peer-reviewed, published studies using WRA have found that there is a high probability of jatropha becoming invasive in Florida and the U.S.[50] The best predictor of whether a species will be invasive in a new habitat is whether that species has been invasive in other regions where it has been introduced. Looking at other regions where jatropha has been introduced yields numerous examples of its high invasive potential. In fact, it has been listed as a weed in Brazil, Fiji, Honduras, India, Jamaica, Panama, Puerto Rico, and El Salvador.[51]

Under Executive Order 13112 (1999), a federal agency may not "authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere." The undersigned groups believe that under the RFS, feedstocks at high risk of becoming invasive should not be approved as new pathways. For feedstocks that require further evaluation according to WRAs, we recommend that they be approved only on a pilot basis, with stringent best management practices required to reduce the risk of escape and ongoing monitoring and mitigation to assess invasiveness.

We are concerned not only that jatropha will be approved despite its high potential for becoming invasive, but also that the analysis indicates that if jatropha is approved, risk management plans for jatropha are not likely to be as robust as plans for *Arundo donax* and *Pennisetum purpureum*. If EPA approves jatropha, we urge the Agency to include robust risk management requirements that are written with the guidance of the National Invasive Species Council and relevant federal and/or state agencies, including consultation with international agencies for jatropha grown outside of the U.S. Because jatropha can regenerate from its roots and continue to reproduce after a field is abandoned (as stated in the GHG analysis), it is critical that risk management plans include plans and funding set aside for eradication of jatropha on fields that are abandoned.

[VI] Conclusion

The undersigned groups appreciate the opportunity to comment on EPA's analysis of the GHG emissions attributable to the production and transport of jatropha oil for use in biofuel production. We support EPA's effort to improve the environmental performance of the RFS by approving new pathways by which feedstocks—particularly those that do not compete for existing farmland—can be used to produce "advanced biofuels." Several aspects of the proposed jatropha determination deserve closer analysis and/or fuller explanation, however. Before finalizing its assessment of the lifecycle GHG emissions associated with biofuels made from jatropha oil, EPA must explain and justify: (1) the key comparisons it makes between jatropha and soybean oil; (2) its assumptions about how, when, and where jatropha production will expand throughout the world; (3) its assumptions about land use and any impacts on land rights, water, and food security; and (4) its future plans to ensure jatropha does not become an invasive species.

Thank you for the opportunity to provide comments. We hope that our remarks provide useful guidance for EPA's final decision. We appreciate your consideration.

Respectfully submitted,

Kelly Stone, Policy Analyst
ActionAid USA

Sheila Karpf, Consultant
Jonathan Lewis, Senior Counsel
Clean Air Task Force

Emily Cassidy, Research Analyst
Environmental Working Group

Aviva Glaser, Senior Policy Specialist
National Wildlife Federation

[1] See EPA, *Improving the Petition Process for New Renewable Fuel Pathways* (March 2014) (http://www.epa.gov/otaq/fuels/renewablefuels/documents/420f14011.pdf).
[2] 80 Fed. Reg. 61406, 61408/3 (October 13, 2015).
[3] HLPE. 2013. *Biofuels and Food Security: A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security*, Rome, 45. (http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-5_Biofuels_and_food_security.pdf).
[4] 80 Fed. Reg. 61406, 61409/3 (October 13, 2015).
[5] Claude D. Convisser, *How Bioenergy and Food Crops Thrive Together: A Response to the World Resources Institute's Working Paper*…, POP Diesel (February 7, 2015) (http://www.popdiesel.com/response.php).
[6] United Nations Food and Agriculture Organization, *Jatropha – A Bioenergy Crop for the Poor*, (July 22, 2010) (http://www.fao.org/news/story/en/item/44142/icode/).
[7] Wouter MJ Achten, *et al.* 2007. *Jatropha Biodiesel Fueling Sustainability?* Biofuels, Bioproducts and Biorefining. 1 (4): 283–291. DOI: 10.1002/bbb.39. (http://onlinelibrary.wiley.com/doi/10.1002/bbb.39/abstract;jsessionid=EEA41B013B2CDB4DFB2B374E69E53076.f02t01).
[8] 80 Fed. Reg. 61406, 61415/2 (October 13, 2015).
[9] *Brazil*, U.S. Agency for International Development (2015) (https://www.usaid.gov/brazil).
[10] O. Xunmin, *et al.* 2009. *Energy Consumption and GHG Emissions of Six Biofuel Pathways by LCA in (the) People's Republic of China.* Appl. Energ. 86: 197–208. DOI: 10.1016/j.apenergy.2009.04.045. (http://www.globalbioenergy.org/fileadmin/user_upload/gbep/docs/GHG_clearing_house/docs/CH-_Energy_consumption_and_GHG_emissions_of_six_biofuel_pathways.pdf).
[11] Joana Almeida, *et al.* 2011. *Benchmarking the Environmental Performance of the Jatropha Biodiesel System through a Generic Life Cycle Assessment*. Environ. Sci. Technol. 45 (12): 5447–5453. DOI: 10.1021/es200257m. (http://pubs.acs.org/doi/abs/10.1021/es200257m).
[12] Robert Bailis and Jennifer Baka. 2010. *Greenhouse Gas Emissions and Land Use Change from Jatropha Curcas-Based Jet Fuel in Brazil*. Environ. Sci. Technol. 44 (22): 8684–8691. DOI: 10.1021/es1019178. (http://pubs.acs.org/doi/abs/10.1021/es1019178).
[13] Robert Bailis and Jennifer Baka. 2010. *Greenhouse Gas Emissions and Land Use Change from Jatropha Curcas-Based Jet Fuel in Brazil*. Environ. Sci. Technol. 44 (22): 8684–8691. DOI: 10.1021/es1019178. (http://pubs.acs.org/doi/abs/10.1021/es1019178).
[14] Wouter MJ Achten, *et al.* 2007. *Jatropha Biodiesel Fueling Sustainability?* Biofuels, Bioproducts and Biorefining. 1 (4): 283-291. DOI: 10.1002/bbb.39. (http://onlinelibrary.wiley.com/doi/10.1002/bbb.39/abstract;jsessionid=EEA41B013B2CDB4DFB2B374E69E53076.f02t01).
[15] Wouter MJ Achten and Louis V Verchot. 2011. *Implications of Biodiesel-Induced Land-Use Changes for CO2 Emissions: Case Studies in Tropical America, Africa, and Southeast Asia*. Ecology and Society. 16 (4): 14. DOI: 10.5751/ES-04403-160414. (http://www.ecologyandsociety.org/vol16/iss4/art14/ES-2011-4403.pdf).
[16] Wouter MJ Achten, *et al.* 2013. *Global Greenhouse Gas Implications of Land Conversion to Biofuel Crop Cultivation in Arid and Semi-arid Lands – Lessons Learned from Jatropha*. Journal of Arid Environments. 98: 135-145. DOI: 10.1016/j.jaridenv.2012.06.015. (http://www.sciencedirect.com/science/article/pii/S014019631200184X).
[17] Henny A. Romjin. 2011. *Land Clearing and Greenhouse Gas Emissions from Jatropha Biofuels on African Miombo Woodlands*. Energy Policy. 39 (10): 5751-5762. (http://econpapers.repec.org/article/eeeenepol/v_3a39_3ay_3a2011_3ai_3a10_3ap_3a5751-5762.htm).
[18] *Jatropha Plant Oil*, POP Diesel (2015) (http://www.popdiesel.com/cultivation.php).
[19] Robert Bailis and Jennifer Baka. 2010. *Greenhouse Gas Emissions and Land Use Change from Jatropha Curcas-Based Jet Fuel in Brazil*. Environ. Sci. Technol. 44 (22): 8684–8691. DOI: 10.1021/es1019178. (http://pubs.acs.org/doi/abs/10.1021/es1019178).

[20] Wouter MJ Achten, *et al.* 2013. *Global Greenhouse Gas Implications of Land Conversion to Biofuel Crop Cultivation in Arid and Semi-arid Lands – Lessons Learned from Jatropha*. Journal of Arid Environments. 98: 135-145. DOI: 10.1016/j.jaridenv.2012.06.015. (http://www.sciencedirect.com/science/article/pii/S014019631200184X).

[21] Wouter MJ Achten, *et al.* 2010. *Life Cycle Assessment of Jatropha Biodiesel as Transportation Fuel in Rural India.* Applied Energy. 87 (12): 3652–3660. DOI: 10.1016/j.apenergy.2010.07.003. (http://www.sciencedirect.com/science/article/pii/S0306261910002564).

[22] Simon Gmünder, *et al.* 2012. Journal of Biomedicine and Biotechnology. 2012. DOI: 10.1155/2012/623070. (http://www.hindawi.com/journals/bmri/2012/623070/).

[23] HLPE. 2013. *Biofuels and Food Security: A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome*, 46. (http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-5_Biofuels_and_food_security.pdf).

[24] 80 Fed. Reg. 61406, 61409/2 (October 13, 2015).

[25] Robert Bailis and Jennifer Baka. 2010. *Greenhouse Gas Emissions and Land Use Change from Jatropha Curcas-Based Jet Fuel in Brazil*. Environ. Sci. Technol. 44 (22): 8684–8691. DOI: 10.1021/es1019178. (http://pubs.acs.org/doi/abs/10.1021/es1019178).

[26] Sangeeta Sinha *et al.* 2013. *Life Cycle Analysis and Modelling (LCAM) of Jatropha as Biofuel in Dynamic Economic Environment of Newly Emerging Economies.* Review of Asian and Pacific Studies. 38: 119-139. (http://repository.seikei.ac.jp/dspace/bitstream/10928/418/1/asia-38_119-139.pdf).

[27] 80 Fed. Reg. 61406, 61413/1 (October 13, 2015).

[28] 80 Fed. Reg. 61406, 61408/3 (October 13, 2015).

[29] United States Department of Agriculture, *World Agricultural Supply and Demand Estimates* (December 10, 2014) (http://usda.mannlib.cornell.edu/usda/waob/wasde//2010s/2014/wasde-12-10-2014.pdf).

[30] *See* CK Wright and MC Wimberly. 2013. *Recent Land Use Change in the Western Corn Belt Threatens Grasslands and Wetlands*. Proc. Natl. Acad. Sci. 110 (10): 4134-9. DOI: 10.1073/pnas.1215404110. (http://www.ncbi.nlm.nih.gov/pubmed/23431143); Tyler Lark *et al*. 2015. *Cropland Expansion Outpaces Agricultural and Biofuel Policies in the U.S.* Environmental Research Letters. 10 044003. DOI: 10.1088/1748-9326/10/4/044003. (http://iopscience.iop.org/article/10.1088/1748-9326/10/4/044003/meta;jsessionid=FF7A2523BCA086214630898ABEE5FEDE.c4.iopscience.cld.iop.org).

[31] David B. Lobell *et al*. 2014. *Greater Sensitivity to Drought Accompanies Maize Yield Increase in the U.S. Midwest*. SCIENCE. 344 (6183): 516-519. DOI: 10.1126/science.1251423. (https://www.sciencemag.org/content/344/6183/516).

[32] 80 Fed. Reg. 61406, 61415/1 (October 13, 2015).

[33] Richard J. Plevin *et al.* 2015. *Carbon Accounting and Economic Model Uncertainty of Emissions from Biofuels-Induced Land Use Change.* Environ. Sci. Technol. 49 (5): 2656–2664. DOI: 10.1021/es505481d. (http://pubs.acs.org/doi/abs/10.1021/es505481d).

[34] Thomas W. Hertel, *et al.* 2010. *Effects of US Maize Ethanol on Global Land Use and Greenhouse Gas Emissions: Estimating Market-mediated Responses*. BioScience. 60 (3): 223-231. DOI: 10.1525/bio.2010.60.3.8. (http://web.ics.purdue.edu/~hertel/data/uploads/publications/bioscience-ethanol.pdf).

[35] Tim Searchinger and Ralph Heimlich. 2015. *Avoiding Bioenergy Competition for Food Crops and Land.* World Resources Institute Working Paper, Installment 9 of Creating a Sustainable Food Future. (http://www.wri.org/sites/default/files/avoiding_bioenergy_competition_food_crops_land.pdf).

[36] Tim Searchinger, *et al.* 2015. *Do Biofuel Policies Seek to Cut Emissions by Cutting Food?* SCIENCE. 347 (6229): 1420-1422. DOI: 10.1126/science.1261221. (https://www.sciencemag.org/content/347/6229/1420.short).

[37] *See* EPA, *Program Announcement: Improving the Petition Process for New Renewable Fuel Pathways* (March 2014).

[38] Clean Air Act §211(o)(1)(I)(i).

[39] Ben Larson, *How EPA is Letting the RFS Become a Driver of Land Conversion*, National Wildlife Federation (October 11, 2013) (http://www.nwf.org/~/media/PDFs/wildlife/farm%20%20bill/RFS_factsheet_v1_10-11-13.pdf).

[40] 80 Fed. Reg. 61406, 61410/3 (October 13, 2015).

[41] Robert Bailis and Jennifer Baka. 2010. *Greenhouse Gas Emissions and Land Use Change from Jatropha Curcas-Based Jet Fuel in Brazil*. Environ. Sci. Technol. 44 (22): 8684–8691. DOI: 10.1021/es1019178. (http://pubs.acs.org/doi/abs/10.1021/es1019178).
[42] Robert Bailis and Jennifer Baka. 2010. *Greenhouse Gas Emissions and Land Use Change from Jatropha Curcas-Based Jet Fuel in Brazil*. Environ. Sci. Technol. 44 (22): 8684–8691. DOI: 10.1021/es1019178. (http://pubs.acs.org/doi/abs/10.1021/es1019178).
[43] Clean Air Act §211(o)(1)(I)(i).
[44] HLPE. 2013. *Biofuels and Food Security: A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome*, 53. (http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-5_Biofuels_and_food_security.pdf).
[45] *Biofueling Hunger: How US Corn Ethanol Policy Drives Up Food Prices in Mexico*, ActionAid USA (May 2012) (http://www.actionaid.org/publications/biofueling-hunger-how-us-corn-ethanol-policy-drives-food-prices-mexico).
[46] *Biofuel Plantation Threatens Dakatcha Woodland*, ActionAid (2012) (http://www.actionaid.org/videos/biofuel-plantation-threatens-dakatcha-woodland).
[47] HLPE. 2013. *Biofuels and Food Security: A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome*, 85. (http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-5_Biofuels_and_food_security.pdf).
[48] HLPE. 2013. *Biofuels and Food Security: A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome*, A2. (http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-5_Biofuels_and_food_security.pdf).
[49] *USAID Country Profile on Property Rights and Resource Governance: Brazil,* USAID (2015) (http://www.usaidlandtenure.net/sites/default/files/country-profiles/full-reports/USAID_Land_Tenure_Brazil_Profile.pdf).
[50] DR Gordon, *et al.* 2011. *Assessing the Invasive Potential of Biofuel Species Proposed for Florida and the United States Using the Australian Weed Risk Assessment*. Biomass Bioenergy 35: 74–79. DOI: 10.1016/j.biombioe.2010.08.029. (http://www.sciencedirect.com/science/article/pii/S0961953410002862).
[51] JA Duke. 2001. *Handbook of Nuts*. CRC Press, Boca Raton.