

Considering the future of *Prosopis*: Participatory Scenario Analysis in Afar, Ethiopia

September 2018

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The five-year ASSAR project (Adaptation at Scale in Semi-Arid Regions, 2014-2018) uses insights from multi-scale, interdisciplinary work to inform and transform climate adaptation policy and practice in ways that promote the long-term wellbeing of the most vulnerable and those with the least agency.

Prosopis management in Ethiopia

- The invasive plant species *Prosopis juliflora* is a huge issue for populations in semi-arid lands, reducing pasture for livestock, blocking access to water, causing physical harm, and creating other negative impacts.
- To date, the different ways used to manage *Prosopis* have struggled to control its spread and address its impacts.
- Our research shows that preferences for managing *Prosopis* are influenced by age, gender, location and main livelihood of the affected community. There are large differences within and between communities for preferred management interventions.
- Government, non-governmental organisations (NGOs) and individual communities have different preferences for how to deal with *Prosopis*.
- Different management interventions will result in different sets of people doing better or losing out. Trade-offs need to be made explicit in the design and consultation phase of interventions.
- These management issues highlight the importance of consulting and engaging in ways that are sensitive to differences within and between communities.

Participatory Scenario Analysis (PSA): Understanding the future together

Using a novel research method called PSA, the ASSAR research team brought together a wide range of affected stakeholders to explore the impacts of *Prosopis* in Ethiopia's drylands and analyse different possible management solutions. Over a six-month period, we engaged with three communities in the Middle Awash Valley in Southern Afar: Alola, Bedula'ali (both in Awash Fentale Woreda) and Gonita Birka (Amibara Woreda). We also worked with a number of representatives from government, research institutions and non-governmental organisations.



What is PSA?

PSA is a deliberative process through which groups of stakeholders – including those traditionally excluded from decision-making – are guided through an exploration of the positive and negative trade-offs associated with different visions of the future. PSA facilitates engagement with communities that are currently politically marginalised and encourages their views to be better incorporated into decision-making processes around pressing environmental concerns that affect their lives.

Prosopis: a thorny invader

The genus *Prosopis* occurs in almost all the world's hot arid and semi-arid regions. It has been introduced to over 100 countries¹ and is one of the most widely known types of invasive plant. In Ethiopia, *Prosopis juliflora* has harmed rangeland ecology, is damaging farm land, and is threatening pastoral and agro-pastoral livelihoods. Between 1973 and 2004, the plant expanded into new areas at a rate of over 3km² per year in Amibara Woreda alone. By 2020, nearly 31% of this Woreda could be covered by the invasive shrub². Furthermore, *Prosopis* has invaded areas of significant importance for wildlife, such as reserves and national parks, threatening

biodiversity. These risks are likely to become more pronounced under climate change. *Prosopis* is well suited to arid and extreme conditions, suggesting that it will continue to thrive in the harsher climatic conditions forecast for Ethiopia, further threatening native flora, fauna and livelihoods.

To respond to the twin threat of climate change and the ongoing invasion of *Prosopis*, people and institutions at all levels within a country need to adapt and re-evaluate the ways they manage climate-related risks, now and into the future.




Plans for *Prosopis*: the pros and cons

ASSAR's PSA in Ethiopia supported communities in sharing their views about the strengths and weaknesses of different management approaches for *Prosopis*. Using a workshop format, the ASSAR PSA guided participants through a series of activities during which they discussed the impacts of *Prosopis*, explored how the spread and invasion may change in future under anthropogenic climate change, and then analysed different management scenarios.

By analysing scenarios of how to manage *Prosopis* in future, participants were able to think through the respective strengths and weaknesses of alternative approaches and to make judgements about how different social groups might fare. For example, the younger generations might do better in some scenarios compared to others. Or people living closer to settlements and watercourses may receive greater benefits than those

who live in more remote locations. Descriptions of each scenario were presented using a visual image to help engage participants and make the workshops more accessible to non-literate participants.





How climate change is expected to affect the Greater Horn of Africa

- The Greater Horn of Africa is expected to warm faster than the rest of the world.
- The highest temperature increases are set to take place in the northern region, which includes northern parts of Ethiopia.
- Projections show longer dry spells and shorter wet spells.
- Precipitation changes remain uncertain across the Greater Horn of Africa but there is a significant risk of a substantial decrease over the central and northern parts of Ethiopia.
- These changes in climate will likely impact negatively on livelihoods and key sectors including agriculture, water, energy, and health.

Source: Osima, S. *et al.* 2018. [Projected climate over the Greater Horn of Africa under 1.5 °C and 2 °C global warming](#). *Environmental Research Letters*.

Different communities. A common problem.

ALOLA

Alola is in Dubdub Kebele, close to the main town in Awash Fentale Woreda - Awash Sabat Kilo. Despite Alola's proximity to the town of Awash Sabat Kilo, the Kebele and its population are considered purely pastoral. *Prosopis* is present in the area but has yet to form dense thickets as seen in Bedula'ali.



BEDULA'ALI

Bedula'ali is close to Werer. The Kebele and its population is predominantly agro-pastoral and has been villagised. In practice this means that all households have been allocated land for farming but not necessarily pre-built dwellings. The area is used more intensively than Alola and Gonita Birka. There are cotton and sugarcane plantations and irrigation channels that run very close to the settlement. The area around the settlement is infested with *Prosopis*.



GONITA BIRKA

Gonita Birka is a pastoral village to the east of the main asphalt road running north to Djibouti from Awash Arba. It is the most remote of the three sites where community workshops were held and the one that relies most on pastoralism. Although the land is less intensively used in this village compared to the other two settlements, there are significant amounts of *Prosopis* present. In some areas it is starting to block movement and migration corridors.



PSA workshops

During the main stage of the PSA we held discrete workshops with different stakeholder groups to understand who the winners and losers are likely to be in the near-future under four different *Prosopis* management scenarios. The workshops were similar to group interviews during which we asked participants about the problems that *Prosopis* causes, the advantages that *Prosopis* brings and their opinions on a range of different potential management approaches. We aimed to uncover a critical understanding of the ways these management approaches could assist or impede adaptation over the next five to 10 years.

Along with the workshops with the three communities in Awash Fentale and Amibara Woredas (Alola, Bedula'ali and Gonita Birka), we held two additional workshops: one with a group of representatives from local government and another with representatives from NGOs. Instead of bringing all these groups together for one workshop we held separate workshops so we could explore whether different perceptions of the problem were present between different stakeholders and also whether they favoured different management approaches.

Community workshops

We held one workshop in each community. In each workshop, for most of the discussions the participants were split into four groups: older women, older men, younger women and younger men. Each group had five people. This was to ensure that people felt more at ease to speak freely, rather than deferring to others whose age and gender traditionally affords them greater social standing. It helped us understand if there were any key differences in perception according to age or gender.

Government workshop

The participants for the government workshop were drawn from Awash Fentale and Amibara Woreda. They represented the Woreda administration, the Water Office, and the Pastoral and Agro-Pastoral Office and Land Management. Representatives from the Pastoral Community Development Project (PCDP) for both Woredas were also present. Although the PCDP is funded by the World Bank it is administered within local government at a Woreda level. The remaining participants represented Awash Basin Authority, Haledegie Wildlife Reserve and Samara University.

NGO workshop

The participants for the NGO workshop represented a mix of international NGOs that were working, or had been working, on the *Prosopis* issue and local research institutes. The international NGOs included the Food and Agricultural Organisation, Save the Children, Italian Development Committee, Farm Africa, AMREF Health, and Care Ethiopia. The Afar Pastoral and Agro-Pastoral Research Institute and Gewane College were the local research organisations.

Feedback meetings

After the main stage of the PSA process we held a further two workshops at the local and national level. At those we shared results from the first phase and focused on steps that could be taken locally and nationally in the short, medium and long terms to support activities that promote effective and equitable management of *Prosopis*.

Four scenarios for dealing with *Prosopis*

In the first phase of the process we gave workshop participants four management scenarios for *Prosopis* and asked them to rank their preferences. Participants discussed in groups the advantages and disadvantages of each of the four management scenarios, focussing in part on how these might affect different population groups. They also reflected on the social and ecological trade-offs involved in each. Each person was then given a ballot paper listing the four different scenarios. Individuals were given 10 votes, and ranked each scenario according to their preference: four votes for the most preferred, three for second best, two for the third best, and one for the least preferred. These results were aggregated for each group (in the community workshops these were the socially-differentiated groups based on age and gender) to create scores which were discussed further by the participants as a whole. Our findings combine the statistics from the scoring (number of votes cast, and the first and second-choice preferences) with key points arising from the discussions.

Scenario 1: Containment

- Eradication of *Prosopis* is accepted as impossible.
- The main focus of management activities is on limiting the spread of *Prosopis* and containing the invasion.
- Local networks are formed to prevent spread into areas that are highly valued and currently free from *Prosopis* (but susceptible to invasion).
- Existing infestations are tackled to prevent expansion by controlling the outer perimeter.
- Greater efforts are made to reduce reliance on pods for feed and at times of scarcity (during the dry season and droughts).
- Weather becomes more uncertain and less predictable.



Scenario 2: Targeted eradication

- Eradication of *Prosopis* is accepted as impossible.
- The main focus of management activities is on targeted eradication: clearing *Prosopis* in areas of high value and not intervening in areas considered low value.
- Where practical, mechanized or biological controls are used. In other locations more labour-intensive methods are employed (such as cutting and burning, chemical application).
- As land must be used to prevent reinvasion, the areas targeted for clearance tend to be those that are suitable for more intensive land uses (such as farming).
- Weather becomes more uncertain and less predictable.





Scenario 3: Large-scale commercial utilisation

- Eradication of *Prosopis* is accepted as impossible.
- *Prosopis* infestations are managed with the aim of producing a useable biomass resource at a commercial scale with some existing uses also supported (i.e. construction, fencing, charcoal).
- *Prosopis* is actively managed and controlled in locations close to the road network and around biomass plants.
- In more remote locations, where exploitation is not possible, *Prosopis* continues to spread.
- There is not much support provided for affected communities outside of areas that are suitable for the commercial exploitation of *Prosopis*.
- Weather becomes more uncertain and less predictable.



Scenario 4: Community-focused utilisation

- Eradication of *Prosopis* is accepted as impossible.
- Communities are central to the overarching policy goal of utilisation. Control is encouraged by creating a favourable environment through which communities can derive livelihoods from *Prosopis*.
- The main focus is on smaller-scale exploitation by cooperatives and business that focus on things like charcoal, flour production, and animal feed.
- High inputs of skills, knowledge and labour in geographically dispersed locations.
- Attempts to control *Prosopis* are widespread. Affected communities lead the efforts but very dense and aggressive *Prosopis* infestations are difficult to tackle.
- Weather becomes more uncertain and less predictable.



Key findings

Impacts

Prosopis' impacts in Ethiopia's drylands can be grouped under three headings: impacts on population, impacts on livestock and farming, and impacts on ecology (see **Table 1**). The PSA participants indicated that *Prosopis* impedes access to water bodies, makes it difficult for people to move around, and is decreasing the availability of traditional materials used by pastoralists. *Prosopis* affects women particularly since they are responsible for house construction and collecting water and firewood. Elderly people are regarded as more at risk of injury from

the plant, especially at night. One participant said there were instances when people had got lost in dense thickets of *Prosopis*. Children are also at risk. Participants reported that the plant's invasion into settlements reduces the number of safe places for children to play. There were concerns about large predators being able to hide in dense *Prosopis* bushes and more easily attack children. This has increased the anxiety amongst parents and curtailed their willingness to let their children move far from the settlement.

Table 1: Main reported negative impacts of *Prosopis juliflora*

People

- Risk of injury from plant: injury from the thorns; heightened risk for elderly populations.
- Risk of injury from wild animals that shelter in *Prosopis* thickets: reported increase in large predators and snakes.
- Rips and tears clothing.
- Loss of native flora: affects people's sense of place and connection with the landscape.
- Shortage of construction materials for traditional houses: *Prosopis*, when used, was reported to be not as durable (lasting 3-6 months compared to roughly 12 months); reported as particularly affecting women's access to construction materials.
- Relocation of dwellings due to invasion of plant into settlements.
- Irritation associated with *Prosopis* wood as it breaks down: when used to construct dwellings, dust caused by *Prosopis* breaking down leads to skin irritation; tends to affect women and young children who spend more time indoors.
- Diversion of resources to control invasion: time and energy used to keep critical areas free of plant.
- Increasing scarcity of resources: livestock forced to migrate further (impacts on younger men) and leads to increased risk of conflict (but the latter not widely reported).
- Shortage of milk and meat: because livestock has to migrate further for longer for pasture.
- Blocks access routes for people: particularly impacts women who are responsible for water collection.
- Risks to children: fewer safe spaces for recreation and increased risk of attack from wild animals; reported increases in parental anxiety.

Livestock / Farming

- Animals suffer physical injury from thorns.
- Livestock risk injury or death from wild animals sheltering in *Prosopis* thickets: exacerbated as *Prosopis* decreases ability of herders to scan horizon for dangers.
- Reduction in availability of pasture leads to decline in quality and quantity of livestock.
- Blocked movement corridors for livestock.
- Difficult for animals to access water points.
- Health complications associated with eating the pods in large quantities. Pods of *Prosopis* are attractive for livestock. Problems associated when consumed in large quantities.
- Reduces productivity of farmland: resources required to keep farmland free of *Prosopis*.

Ecology

- Outcompetes indigenous flora: *Prosopis* is well suited to arid conditions and temperature extremes and suppresses growth of other plants.
- Reduces availability of water/soil moisture: plant's extensive root system maximises its extraction of soil moisture.
- Change in ambient conditions: some respondents perceived that *Prosopis* increases ambient temperature and/or reduces air flow.
- Increase in mosquitoes associated with increasing humidity.
- Increase in large predators associated with more favourable habitats.

For livestock, participants reported that the plant is blocking traditional migration routes and decreasing pasture availability. This means herds have to migrate further to access pasture and water and those tending them have to stay away for longer periods. Injury and death of livestock is becoming more common. Animals injure themselves on *Prosopis* thorns or suffer illness and even death if they consume the plant's pods in large quantities. *Prosopis* also makes livestock more vulnerable to attack from wild animals. Herders reported being less able to watch their animals due to reduced visibility in the

landscape and because they themselves are at greater risk of injury. Participants expressed a palpable sense of dismay about the changing ecology of the landscape.

Table 2 (below) lists the main uses of *Prosopis* and provides some additional information, or caveats if they were raised, during the discussion, as identified by the participants in the workshops. It should be noted that, and this was particularly the case in the community workshops, people almost universally preferred native flora and used *Prosopis* primarily in the absence of alternatives.



Disfiguration caused by *Prosopis*

Table 2: Uses of *Prosopis juliflora*

Use	Caveats (where applicable)
Fencing to demarcate dwelling boundaries and for animal enclosures.	This can support the plant's encroachment into settlements.
House construction.	Not viewed as favourably compared to native species.
Provides shade and privacy for use as a toilet.	
Has a medicinal value and can help cure skin irritations.	
As shade for people and animals.	Not viewed as favourably compared to native species.
Firewood.	Not viewed as favourably compared to native species.
Charcoal making.	
Pods can be used for animal feed (and for human consumption).	Health complications when consumed in an unprocessed form and in large quantities.
Used to make animal tan.	
Soil conservation.	Disputed: some feel it supports conservation and others not so much.
Makes the environment evergreen.	
Stabilises the weather conditions – helps to cool the environment.	Disputed: some feel it supports conservation and others not so much.
Acts as a windbreak and reduces wind erosion.	

Findings from community workshops

Across the three communities, scenario 2 (targeted eradication) and scenario 3 (commercial utilisation) scored the highest. These scenarios received the greatest number of first and second choice preferences. In each community, however, there were some differences regarding preferred management options.

Figure 1: Total votes for each scenario, broken down by social group in each location. Combined scores show the mean votes across the four sub-groups (20 participants in each community, split into four equal sub-groups).

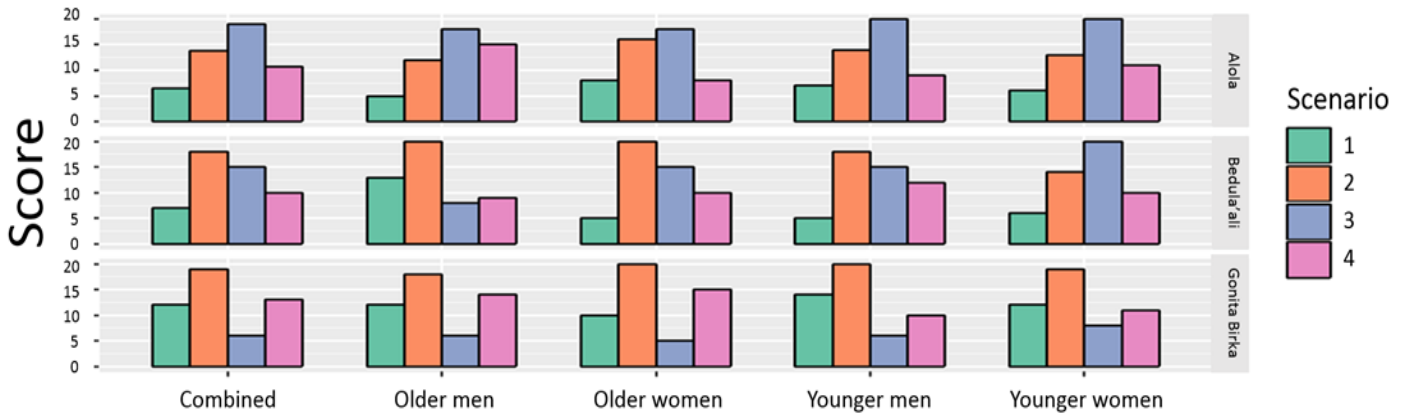


Figure 2: 1st choice preferences broken down by social group in each location. Combined scores show the mean votes across the four sub-groups (20 participants in each community, split into four equal sub-groups).

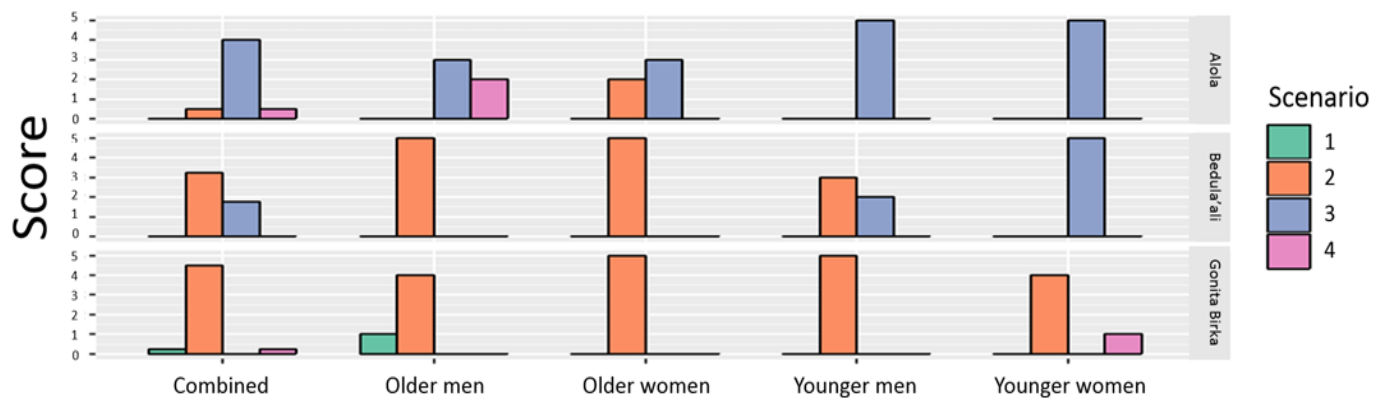
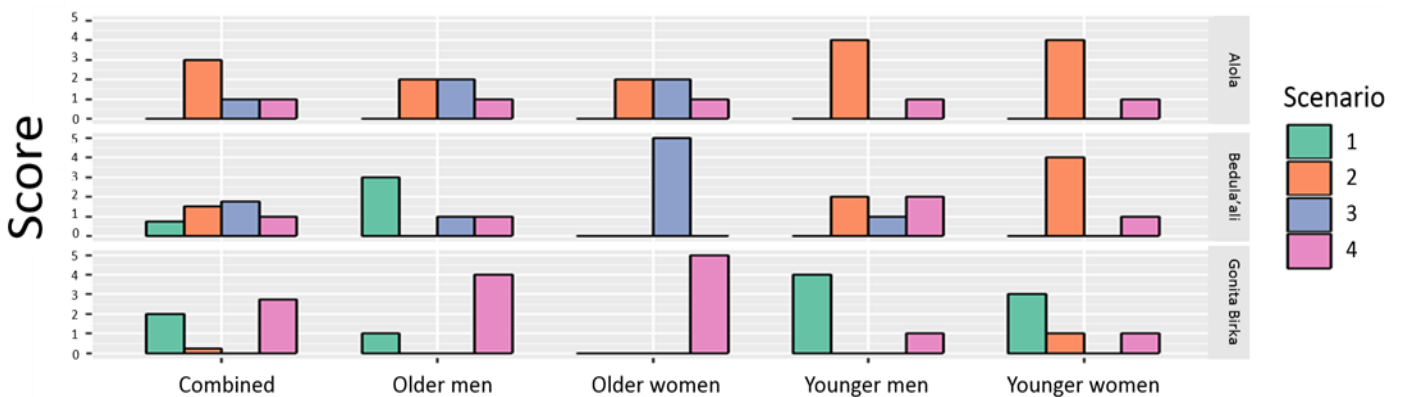


Figure 3: 2nd choice preferences broken down by social group in each location. Combined scores show the mean votes across the four sub-groups (20 participants in each community, split into four equal sub-groups).



Alola

In Alola, each of the socially differentiated groups scored scenario 3 the highest. In scenario 3, people saw the prospect of income generation and employment, either directly through the factory or indirectly with associated businesses or through the cutting and collection of *Prosopis*. People felt a factory would lead to a range of other possible benefits and improvements to infrastructure. These included better roads, the provision of electricity, development of water points, and services such as healthcare, education and other social services. Most of the groups expressed a preference for development that would lead to greater urbanisation. All groups felt that the younger generation were more likely to benefit as they have more skills, education, and labour potential, and are better placed to take advantage of the opportunities that would arise from a commercial operation.

Scenario 2 was the most selected second choice amongst participants in Alola (see Figure 3). The participants liked the targeted approach to land clearance allied to a more mechanised and scalable removal approach (using machines like bulldozers). The community highlighted the importance of maintaining access to water points for animals and domestic use, keeping the most productive rangeland and farmland free from *Prosopis*, ensuring that access routes and movement corridors were actively managed, and keeping areas within and around settlements free.

Despite the perceived advantages, people identified a number of disadvantages to scenario 2. While targeting

specific areas helps direct resources to a perceived need, the participants felt that Alola itself may not benefit from this approach. They perceived high value areas to be primarily along the riverbanks and thought those who control these parcels of land would be the main winners. Using bulldozers and other more mechanised approaches to clear land of *Prosopis* is indiscriminate and also removes native flora. This is unimportant for farmland but is not good for rangeland. People did not see the biological and chemical approaches for controlling *Prosopis* suggested in this scenario in a positive light. The group of older women expressed concern that chemical treatment may harm the animals if, for example, chemicals washed into water bodies and were then consumed by livestock. The measures proposed to control *Prosopis* were seen as expensive and beyond the community's ability to implement. Outside support would be needed if this scenario were to be implemented.

Scenario 4 (community-based utilisation) scored lower than the two scenarios above, except in the older men's group who placed it second based on their scoring. Scenario 1 (containment) received the lowest score and was not selected by any of the participants in either their first or second choice. The community is already trying to contain *Prosopis* and has been doing so for a considerable amount of time. Despite this, *Prosopis* has continued to expand. Overall, participants felt that scenario 1 offered no hope of success. The discussion of scenario 1 emphasises the importance of prior experience in shaping contemporary views on different approaches.



Bedula'ali

In Bedula'ali there was slightly more variation in scoring and also in the preferences of the socially-differentiated groups compared to Alola. Overall, scenario 2 scored the highest. The clearance of land from high value areas was one of the main positive attributes of scenario 2 allied to the potentially more large-scale approach to clearance using bulldozers or a chemical or biological agent. The participants felt this approach would support their existing livelihoods and help them develop alternative ones focused on farming. The continued transition of the community from one of pastoralism to agro-pastoralism was a theme underpinning many of the elements considered strong in this scenario. This mirrors the desire expressed by many participants from Alola for development that enables them to diversify into livelihood activities that are more sedentary: direct or indirect employment in a factory and associated businesses in the case of Alola, and an increase in the amount of farming practiced by the community in Bedula'ali

The preference on eradication and for the transition from pastoralism to agro-pastoralism is likely to be influenced by the location and nature of the settlement (see context above). Bedula'ali is already agro-pastoral with much commercial agriculture close by. The settlement itself is almost totally overrun by *Prosopis* hence the focus on clearance rather than containment.

Participants also recognised a key trade-off with scenario 2. The focus on high-value areas would enable land to be cleared for farming and potentially some rangeland. Other areas likely to be targeted would be water points and access routes. However, most high value land tends to be in areas within which water is available and these areas are often reserved and used by the government.

Areas not deemed to be high value could be the majority of rangeland; those who relied on them would not be the focus of this scenario and would lose out. The importance of experience was shown in terms of a preference for a particular approach to *Prosopis* eradication. All participants have experience of mechanised clearance of *Prosopis* but none have experience of controlling the shrub through either chemical or biological means. Participants were unwilling to express opinions on the latter methods as they felt they lacked the experience and knowledge to do so.

Scenario 3 was the second most selected in terms of first choice preference. As with Alola, this scenario was a preferred choice of the younger generation who felt it would lead to more livelihood and income-generating activities. Younger and older participants thought there may be improvements in infrastructure, such as roads, and the provision of services (water points and better health and education). However, the group of older men questioned whether their community would benefit from

this sort of development. This may go some way in explaining why the older women unanimously voted for this scenario as their second choice preference whereas only one participant in the group of older men placed the scenario within their top two in terms of preference (and this was a second place rather than first).

Interestingly, the group that expressed the most significant doubts about the potential for this scenario to benefit them was the group of younger men. They highlighted that authorities may use the factory development as a pretext to occupy vast areas of land making pastoralism harder to practice. They also felt that local communities would not have the skills to get work in the factory itself and would only end up being employed as labourers or guards. Employees in the factory were more likely to be people from outside the local area. To support this point they used the example of the sugarcane plantations to highlight how their community has gained nothing whereas others have gained a lot. Despite these acknowledged risks, it is interesting to note that the younger men still voted for this scenario whereas the older men did not. Such a voting pattern possibly highlights the importance placed on employment and livelihood opportunities over other potential benefits and risks.

As with Alola, scenario 4 scored lower and scenario 1 received the lowest score. Scenario 1 was not selected by any of the participants in their first choice and only by three older men as a second choice preference. This scenario is already being practiced by the community and has been for a considerable amount of time. The work to try control the spread of *Prosopis* is laborious, puts people at risk of injury, and is generally ineffective.



Gonita Birka



The voting patterns in Gonita Birka were much more uniform compared to the other two communities.

All four socially-differentiated groups scored Scenario 2 the highest. Scenario 4 and Scenario 1 were second and third respectively but with almost identical scores. Interestingly, scenario 3, which scored the highest in Alola and the second highest in Bedula'ali, was scored the lowest in Gonita Birka. Whilst all four of the socially-differentiated groups scored scenario 2 highest, the scoring for the next highest scenario differs by age. The older men and older women preferred scenario 4 whilst the younger men and younger women preferred scenario 1. This pattern of difference by age is evident in all three communities when looking at the second highest scoring scenario.

The key advantages of the top choice (scenario 2) were the targeted eradication of *Prosopis* from areas that have the potential to benefit pastoralist communities. These include watercourses and water points, access routes and migration corridors, and high value grazing land. As is the case with Alola and Bedula'ali, participants appreciated the ability to clear large areas of land quickly using minimal amounts of labour. That said, there was an almost exclusive focus on mechanised clearance approaches; the biological and chemical controls were not discussed. The groups of older men and older women highlighted the prospect that land could be appropriated as a result of the clearing process and that any loss of land would have negative consequences for communities like Gonita Birka. They were resistant to any notions of indebtedness and felt such situations could be used by investors, the government, and NGOs to gain control of land and resources. The groups of younger men and younger women did not specifically raise these issues but did highlight that those living in more remote locations would not benefit from an approach that targeted high value areas.

The universal preference for scenario 2 in Gonita Birka can, in part, be attributed to the purely pastoral livelihoods and remoteness when compared to the other two communities. Whilst pastoralism is the main livelihood in Alola, the settlement is incredibly close to Awash Sabat (the largest town in Awash Fentale Woreda). This proximity appears to have influenced the preference for scenario 3 and increasing levels of urbanisation or developments associated with more urban lifestyles. Bedula'ali, meanwhile, is an agro-pastoral community living cheek by jowl with cotton and sugarcane plantations. The community has already been partly villagised and people are farming or labouring on the plantations. These conditions have undoubtedly influenced their more mixed preferences for scenarios 2 and 3.

Most of the younger men and younger women expressed a second choice preference for scenario 1. The containment approach, whilst having notable drawbacks, did offer some means to try and control *Prosopis* in certain areas. At a local level, it was useful to prevent the plant from spreading into settlements and people's homes. In contrast, the older men and older women felt that the scenario would not address the problem, tends to be implemented in a piecemeal fashion, is very labour intensive, and only addresses some of the mechanisms of dispersal. Ultimately, the older men and women felt the scenario could not succeed. In their eyes, scenario 4 was a better option. One of the main reasons provided for the selection of scenario 4 was the focus on the community as the prime actor responsible for using and controlling the spread of *Prosopis*. Both groups were wary of the government and other outside agencies and preferred a community-centred approach with potential benefits of income generation and alternative livelihoods. In contrast, the younger men and younger women tended to highlight the amount of labour and skills necessary to make this scenario work. The mobile nature of pastoralism makes it harder for people to take advantage of training opportunities. It is possible that the younger participants saw more of the costs for Scenario 4 falling on them and less of the benefits, whereas the older participants saw more of the benefits (in terms of skills and access to finance) and less of the costs (in terms of labour).

Scenario 3 scored lowest. This differs markedly from Alola and Bedula'ali, where it was scored highest or second highest overall. Participants in Gonita Birka felt that scenario 3 would not benefit pastoralists and is more likely to serve the interests of others. Common viewpoints expressed include: people who work in the factory would come from outside, utilisation of *Prosopis* may result in its continued expansion rather than greater control, settlements might be displaced should a factory be located nearby, and that the government cannot be trusted and the community would lose out.

Findings from government and NGO workshops

The workshops with local government and NGO representatives followed a slightly streamlined one-day agenda compared with the community workshops that ran across two days, with less time given to contextualisation of the issues and introduction to the approach. In other respects the process was the same with discussions and scoring exercises undertaken for the different management scenarios.

Government preferences

Government scoring for the scenarios was fairly evenly split. Respondents scored scenario 2 highest, followed by scenario 4 and scenario 1. Overall scoring showed that voting was reasonably evenly distributed across scenarios 1, 2, and 4. Only scenario 3 was rated poorly (see Table 3).

Interestingly, participants' main concern with scenario 3 related to the likelihood that opportunities associated with the development would go to people outside of Afar. This concern was shared with the participants from Bedula'ali and Gonita Birka (although not Alola). Whilst participants from the community workshops were not differentiating between different levels of government,

the participants from the local government workshop recognised that these types of developments are instigated and controlled at either a regional or national level. Thus, local government workers are relatively powerless to demand that employment opportunities and other ancillary benefits are realised by the local populations and potentially also by local government. Although government participants shared a similar set of concerns with the local population, if scenario 3 was implemented local government would be seen as the ones responsible for implementation and, as such, would be likely to experience increased levels of hostility associated with the negatives implications of the scenario.

Table 3: Scenario scoring and preference voting for government representatives

Government	n	Score	1 st choice	2 nd choice	3 rd choice	4 th choice
Scenario 1	12	29 out of 48	2 out of 12	5 out of 12	1 out of 12	4 out of 12
Scenario 2	12	38 out of 48	6 out of 12	2 out of 12	4 out of 12	0 out of 12
Scenario 3	12	20 out of 48	1 out of 12	1 out of 12	3 out of 12	7 out of 12
Scenario 4	12	33 out of 48	3 out of 12	4 out of 12	4 out of 12	1 out of 12

Scenario 2 was most popular with local government representatives. Overall, they felt this scenario offered scope to reclaim land and increase the availability of pasture and farmland. The mechanised approach was viewed positively as large areas could be cleared relatively quickly; biological and chemical measures were considered risky with the potential for unexpected negative side effects. Conversely, they did not highlight the reported issues with large-scale clearance via bulldozer (removal of native flora and detrimental impact on the ability of native grasses to colonize areas of land cleared by bulldozer) raised in some of the community workshops. This emphasises the value of in-depth consultations and discussions with the intended beneficiaries of an intervention to improve the intervention's design and the likely outcomes. The participants also felt that scenario 2 would see an increase in access to and the quality of water resources. Children and women were perceived as beneficiaries. Children would have safer spaces to play in whilst women would be able to access water more easily and with less risk of injury thus decreasing their work burden.

Scenario 4 was also highly regarded by local government participants. The key strengths of this scenario centred on the participatory and inclusive approach that put the community at the centre of the management

intervention. The training and financial support provided would help the community to develop, the increase in livelihood opportunities would enable a greater number of community members to benefit directly, and there would be indirect benefits to older community members through the enhanced social security associated with the general upliftment achieved through plural income generating activities. Importantly, livestock would benefit through this approach as there would be more pasture and also feed, through the harvesting and use of *Prosopis* pods. Negative risks associated with this scenario were the increased likelihood of inter-clan conflict associated with charcoal production. That was also raised in the three community workshops. The participatory approach would help women's development and increasingly diversified income generating activities, although the participants thought this might also increase the burden of work for women.

Lastly, scenario 1 received both first and second choice voting preferences. Interestingly, in the discussions about strengths and weaknesses of the various scenarios, scenario 1 was acknowledged as a failure and unable to control the spread of *Prosopis*. However, it was regarded as low technology and easy to implement at a community level which perhaps helps explain why some people voted for it.

NGO preferences

In contrast to the scores from local government representatives, the representatives from NGOs and research institutes provided a more uniform picture of their preferences. **Scenario 4 was the most popular. Scenarios 2 and 3 received almost the same scores. Scenario 1 scored the lowest** (see Table 4).

As with the views of the local government representatives and many from the community workshops, **the participatory nature of the top ranked**

scenario 4 was highly valued. The participants felt that this was the best scenario in terms of its ability to benefit local people as there are many options for income generation, and training and financial support are provided. Such measures would help to engage the local communities and deliver development. Participants saw the risks with this scenario as related to the level and nature of external support required. They felt it may create dependencies on external actors.

Table 4: Scenario scoring and preference voting for NGO representatives

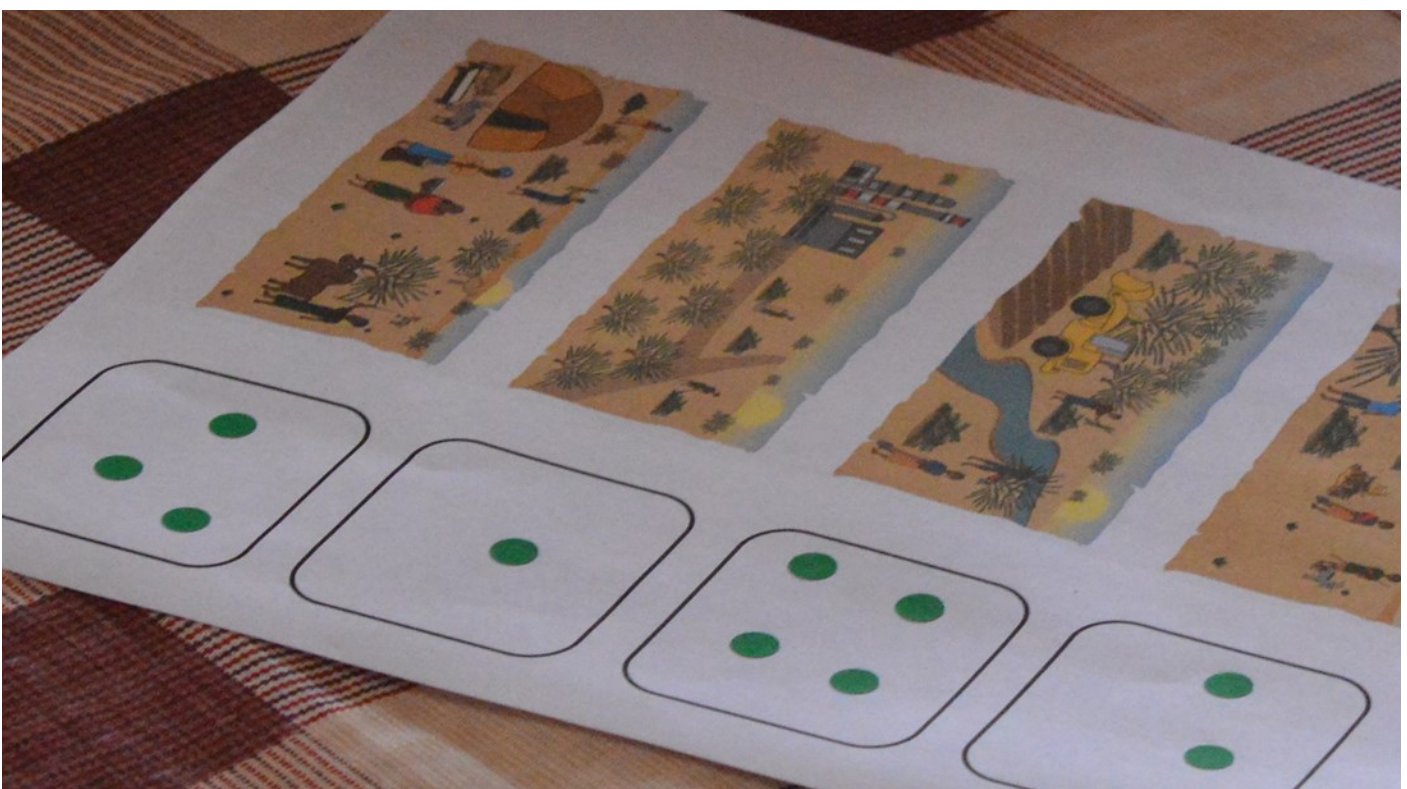
NGO	n	Score	1 st choice	2 nd choice	3 rd choice	4 th choice
Scenario 1	7	7 out of 28	0 out of 7	0 out of 7	0 out of 7	7 out of 7
Scenario 2	7	17 out of 28	0 out of 7	3 out of 7	4 out of 7	0 out of 7
Scenario 3	7	19 out of 28	1 out of 7	3 out of 7	3 out of 7	0 out of 7
Scenario 4	7	27 out of 28	6 out of 7	1 out of 7	0 out of 7	0 out of 7

N.B. The representative from Save the Children was absent during the voting.

The cumulative scores and preference voting for scenarios 2 and 3 were almost identical. For scenario 2, NGO respondents raised a similar suite of strengths and weaknesses as those identified in community workshops. One notable difference is that NGO representatives did not highlight the risk of land appropriation and placed considerably more importance on the usage and ownership rights of clans. This suggests that the NGOs did not perceive a significant risk that communities would lose access and usage rights to land during, or immediately after, it had been cleared of *Prosopis*. In contrast, a major risk identified with scenario

3 was the potential for local people to miss out on the benefits of a large-scale development.

Scenario 1 was the least favoured scenario. The NGO participants simply did not think that it would or could be successful. *Prosopis* spreads by many mechanisms and its highly aggressive nature means that it is impossible to contain. Furthermore, participants discussed the need to create incentives to encourage local populations to work more intensively to tackle the problem of *Prosopis* as it was felt that communities in Afar lack a culture of hard work.



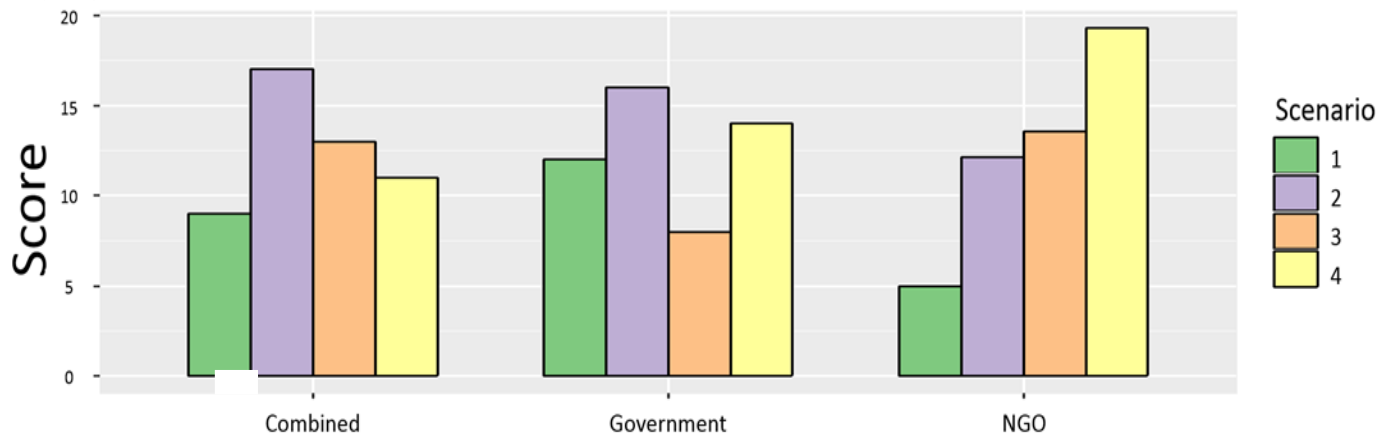




What different preferences mean for tackling *Prosopis*

When considering *Prosopis* management approaches, the intention of government most closely matches the overall preferences of the communities in selecting scenario 2. In contrast, the NGO representatives favoured scenario 4—one of the two least favoured scenarios at a community level.

Figure 4: Combined scores for each scenario showing the mean of the three communities (60 people), government representatives (12 people) and NGO representatives (7 people). The totals have been weighted to enable comparison.

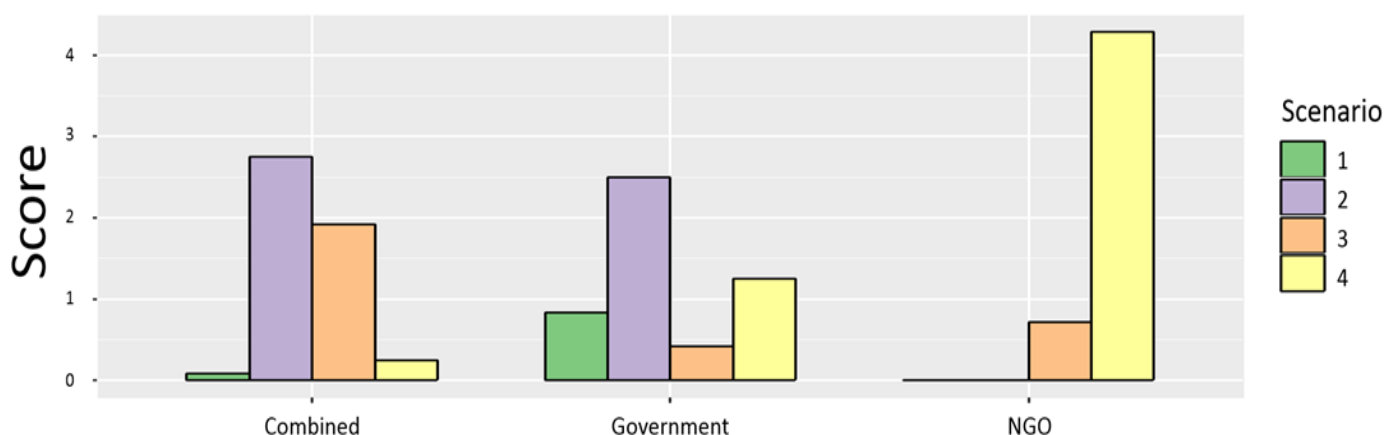


The government’s cumulative scores most closely align with the preferences of the community from Gonita Birka. For the other two communities, voting by government representatives more closely aligns to Bedula’ali than to Alola. The explanation for these patterns might lie in the extent to which the participants from Alola see urbanisation as the key to development within their community and favour a scenario (3) that offers the greatest potential for this. The representatives from both government and NGOs are predominantly drawn from areas that specialise in rural development, water and agricultural issues.

People with knowledge of issues that are more closely aligned to rural development appear more likely to share the preferences of more rural and remote communities rather than those that are proximate to urban areas.

The representatives from NGOs voted strongly in favour of scenario 4. Interestingly, this scenario was not the favoured scenario in any of the community workshops. Only in Gonita Birka did scenario 4 score in the top two for the cumulative score. Across all of the community workshops only three people voted for it as a first choice preference. The disparity between strong NGO preference for scenario 4 compared to the community-level preferences is striking. The difference may be related to the very strong bottom-up, community-focused ethos that is central to the NGOs. However, it is clear from the voting at a community level that their preferences do not mirror those of the NGOs. This suggests that NGOs could be in a position, when providing input into the design and implementation of specific interventions, of advocating for something that runs counter to the wishes of the communities they aim to support.

Figure 5: 1st choice preferences for each scenario showing the mean of the three communities (60 people), government representatives (12 people) and NGO representatives (7 people). The totals have been weighted to enable comparison.



Feedback and action

Following the PSA analysis we collated the results and fed them back to the various stakeholders involved, with the aim of shifting the focus from research to clearly identified actions to address the *Prosopis* problem. We brought together the stakeholders from the main analysis phase so that they could understand one another's perspectives and try to work together toward a shared objective that recognised different priorities and concerns and took the trade-offs into account.

ASSAR hosted a feedback meeting in March 2018 in Awash Sabat Kilo that brought together representatives from the four community workshops and the government and NGO workshops. During this meeting the findings were presented and reflected on, and then the focus of discussions moved from research to identifying a list of actions that participants could take forward individually and collectively.

Specifically, the following questions were asked:

- Can we identify where to target our efforts?
- What actions are likely to be more or less effective? What can actually be implemented in practice? What is realistic?
- Where do we agree and disagree? How can we move forward from here?
- Are there any actions that are likely to be mutually desirable?



Priorities identified at the meeting focused on actions to encourage better management of *Prosopis* and to ensure that this continues, especially for targeted eradication and community-based utilisation. The participants split into mixed groups, facilitated by the researchers, and each agreed on key actions. These were then presented to the whole meeting and discussed further.

Priority activities that emerged from the process were:

- Build **awareness and capacity** in communities
 - through training, specialist extension services, demonstration projects
- Clarify **land use policy and land ownership** of areas to be cleared
 - clarify first what land can be used for and by whom
- Strengthen **incentives for clearance**
 - ensure follow up actions are feasible for rangeland development, water source provision, small-scale irrigation
- Increase **external support** for *Prosopis* management
 - international, national and regional support, including support that enables communities to take action, such as provision of machines
- Develop **improved technology** that reduces intensity of labour required
 - e.g. for grinding pods for animal feed
- Ensure **integration between sectors** (government sectors and NGOs)
 - to make sure clearance is followed by weeding and continuous management

Looking forward

Following this meeting in Awash, the ASSAR team fed back the results of both the main PSA analysis and the feedback discussions to the National *Prosopis* Task Force at a meeting in Addis Ababa. ASSAR and the *Prosopis* Task Force agreed to work together to integrate the findings from the ASSAR research into the ongoing activities of the Task Force and efforts to manage *Prosopis*.

ASSAR team members have also organised additional local capacity development work on *Prosopis* management in the Afar region, and are developing proposals for expanded socio-environmental research on *Prosopis* expansion, impacts, management and use in the region and beyond.



¹ Shackleton, R., Le Maitre, D., Pasiecznik, N. and Richardson, D. 2014. *Prosopis: A global assessment of the biogeography, benefits, impacts and management of one of the world's worst woody invasive plant taxa*. *AoB Plants*.

² Haregeweyn, N., Tsunekawa, A., Tsubo, M., Meshesha D. and Melkie, A. 2013. *Analysis of the invasion rate, impacts and control measures of Prosopis juliflora: a case study of Amibara District, Eastern Ethiopia*. *Environmental Monitoring and Assessments*.

ABOUT ASSAR

ASSAR uses insights from multiple-scale, interdisciplinary work to improve the understanding of the barriers, enablers and limits to effective, sustained and widespread climate change adaptation out to the 2030s. Working in seven countries in Africa and South Asia, ASSAR's regional teams research socio-ecological dynamics relating to livelihood transitions, and the access, use and management of land and water. One of four consortia under the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA), ASSAR generates new knowledge of climate change hotspots to influence policy and practice and to change the way researchers and practitioners interact.

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This work was carried out under the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA), with financial support from the UK Government's Department for International Development (DfID) and the International Development Research Centre (IDRC), Canada. The views expressed in this work are those of the creators and do not necessarily represent those of DfID and IDRC or its Board of Governors.

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