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THE CULTURE AND CONFLICT REVIEW



Biodiesel from Poppies: An Alternative Strategy to Combating the Opium Trade in Afghanistan LCDR Omar J. Wheatley, USN, 10/1/2011

Introduction

Opium production in Afghanistan remains one of the single most important challenges to establishing a stable and secure government for the citizens of Afghanistan. Some progress has been made in the past years as the United States and its allies have made a concerted effort to aid Afghanistan in their counter-narcotics mission. However, despite the fact that 20 of 34 provinces remained “poppy free”, there are indications that economic hardship and rising prices may drive up the opium production levels. The counter-narcotics policies of the United States and Afghanistan include the use of varying strategies which consist of a mix of “carrot-and-stick” approaches where opium growers and traffickers are either punished for their involvement or in some cases, provided financial incentives not to participate in the trade. Eradication efforts have proved expensive and unmanageable, which has led to a focus on alternative economic development. There are a few success stories in this regard with opium farmers switching to food crops, but this typically only happens in areas where the Taliban has been driven out. More alternatives are needed to ensure that the positive trend away from drug production to licit and more viable crops is sustainable. Otherwise, Afghanistan may slide back into the economic and social ruin of opium (Katzman, 2011).

While a historical legacy exists as far back as the fourth century B.C., opium production is not a “traditional” crop. Even as recent as the 1970s, opium production in Afghanistan was limited to approximately 300 metric tons per year (Blanchard, 2009). Production increased significantly during Soviet occupation. An all time high in opium production occurred in 2007, with Afghanistan producing 92% of the world’s opium supply and Afghanistan today still remains the leader in opium production, being responsible for 90% of the world’s opium drug market (United Nations Office on Drugs and Crime).

United States policy has evolved over the course of the conflict, with an early emphasis on poppy crop eradication and then offering incentives for alternative crops for food. Eradication methods were limited to manual destruction of the crops, vice aerial spraying or use of mycoherbicides due to political and health concerns, but ultimately were ineffective at significantly reducing the opium-producing poppy. While many provinces have been classified as “poppy-free”, defined as producing less than 100 hectares, production in the more insecure provinces such as Kandahar and Helmand have not been significantly reduced and in some cases continues to increase. Alternative crops pose an economic challenge, as the financial payoff for opium is drastically greater than for food products.

Current Counter-Narcotics Strategy

The U.S. State Department addresses the current policy with its Five Pillar Plan which attempts to address the drug trade on different levels. It focuses on disrupting Afghanistan’s “opium-based economy” and strengthening the Afghan government in its own counter-narcotics efforts. The pillars are (Schweich, 2007):

1. Public Information – inform and educate the public (Afghan citizens) through community outreach programs
2. Alternative Development – provide economic alternatives to poppy cultivation by providing business and agricultural development programs designed to provide jobs in reconstruction, development, and licit agricultural activities
3. Elimination/Eradication – destroy poppy crops under the auspices of Afghan central and regional government
4. Interdiction – decrease trafficking and processing of opium/heroin using a U.S. trained domestic counter-narcotics police force
5. Law Enforcement/Justice Reform – increase law enforcement and efficacy of the rule of law by empowering the police and justice sectors of the Afghan government

The Strategy, published in 2007, was developed at a time when opium production reached its highest rates. The effectiveness of the overall strategy is indeterminate because while a downward trend was observed, in the following years, the production levels leveled off between 2009 and 2010 and currently remain well above pre-war levels (See: Figure 1).

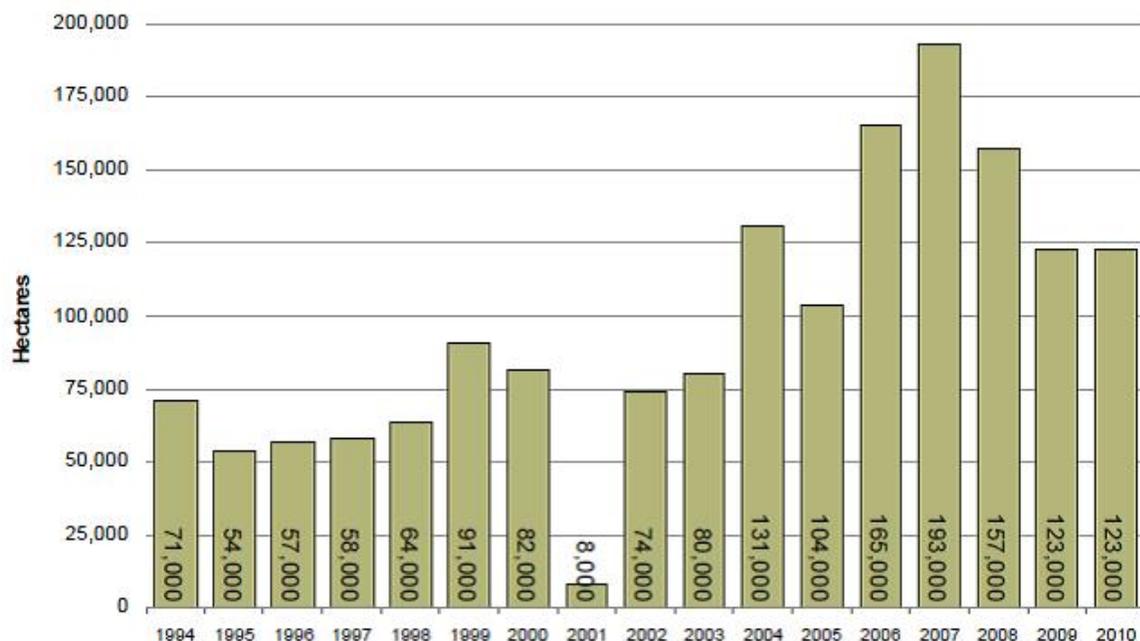


Figure 1 – Opium Cultivation in Afghanistan (ha), 1994-2010 (From United Nations Office on Drug and Crime, 2010)

The failure of eradications, and for that matter any method to encourage farmers to abandon poppy production for licit crops, is that the farmers get into a vicious debt cycle that they cannot escape. The figure below illustrates the cycle, which can only be broken if the profit margin at the end of the harvest is sufficient to negate the need for financial assistance in the following season. Paying off the loan, while retaining a small profit margin is sometimes not enough for the farmer to become self-sufficient, as a loan the following year provides the funding to plant again. In cases where the poppy crop is destroyed, the farmer is left with a massive debt which requires additional loans and increased production the following year in order to pay off the new debt as well as the old. The model, however, does not take into account additional pressures on the farmer from their lenders such as threats and intimidation.

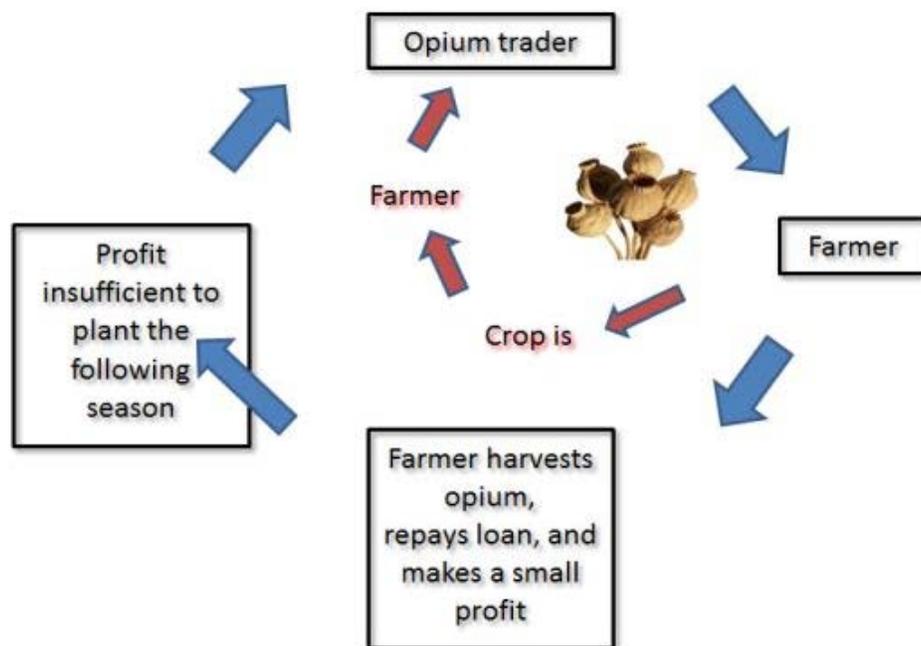


Figure 2 – Cycle of Debt for Opium Farmers

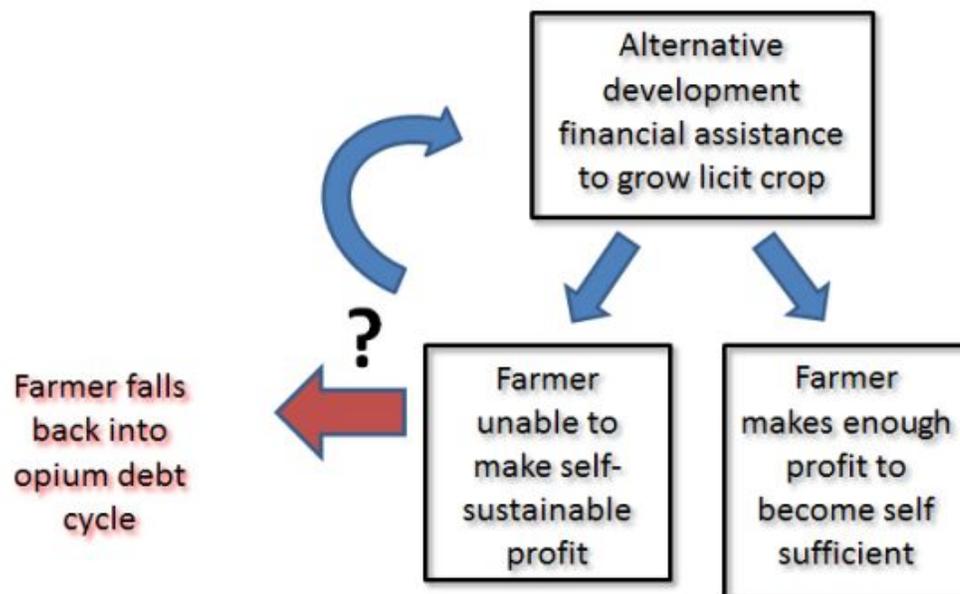


Figure 3 – Breaking the Cycle of Debt Using Alternative Agricultural Development

Despite efforts to eliminate cultivation, it appears that poppies will continue to remain a major crop for Afghanistan. This article focuses on an alternative use of poppy to address the second pillar, specifically examining the feasibility of using non-opium producing poppy as an economic alternative for Afghanistan. There are several licit uses for poppy-based consumables, primarily for medical based opiates such as morphine and codeine. While poppies are also used for their seeds in food products, there is an increasing interest in poppy oil which itself has multiple potential uses, one of which is as a biofuel.

The poppy plant is a very rugged plant, requiring very little water compared to food-based biofuels such as corn, rapeseed, palm, and soy. Poppies are a proven crop in Afghanistan. In recent years, a genetically modified poppy variant has been created that contains no opium or the alkaloids necessary for the production of medicinal opiates. If there are varieties that provide the benefits as a biofuel or even for food without the inherent alkaloids that are necessary to produce opium, could they not be considered an alternative economic resource for Afghanistan?

Meeting the Challenge of Energy Demand

One of the challenges facing the rehabilitation of Afghanistan is getting its economy on firm ground. Great strides have been made in improving the basic infrastructure of the country. One obstacle that faces major additions to the infrastructure is the demand for energy. USAID has spent 10% of their Afghanistan budget on delivering power to Afghanistan with a goal that was supposed to power households in 65% of urban areas and 25% of rural areas by 2010. This has not yet been achieved due to ever increasing demands for electricity, especially in Kabul where the population has increased six-fold since the Taliban lost control in 2001. To support the growth from approximately half a million people during Taliban rule to the current population which exceeds three million, Afghanistan has had to import electricity from its neighbors to meet the growing demands. The overly ambitious Kajaki Dam project, which was to deliver a third turbine in order to provide a substantial increase in power in Helmand province, has been delayed indefinitely due to cited "technical and security" problems. With no public announcement as to the estimated completion date, it can be assumed that the project has been abandoned to support smaller projects to provide power to various regions in the country (Katzman, 2011).

Currently, Afghanistan imports over half of its energy usage due to its limited supply of naturally occurring resources that can be converted into power. The primary domestic sources of power come from hydroelectric dams and from geothermal plants. In 2009, hydro- and geothermal power made up 40.1% and 4.5% respectively, where in 2010, the numbers declined to 35.2% and 3.9% (Afghan Energy Information Center). An over reliance on external sources of energy only make it harder to put dollars to use in nation-building when a large portion of the budget is being used to provide basic domestic power requirements. Therefore, finding a solution which eliminates, or at the very least, reduces the reliance on energy imports would result in large economic gains for Afghanistan.

Crude oil deposits are known to exist in Afghanistan, however most companies are hesitant to make the large initial investments required due to the poor security situation in the country. Natural gas is available; however production has fallen significantly with the deterioration of the infrastructure which started as far back as the Soviet occupation. As the security situation improves, it is possible that the untapped oil and natural gas resources will be accessed, but building and sustaining the infrastructure will take time. A much more readily accessible source is highly desired.

Biodiesels offer a great potential market for Afghanistan to enter. The international community has begun to realize the

necessity of freeing itself from dependence on petroleum, which is theoretically a finite resource. Renewable resources such as biofuels which come from sugars, starches, and vegetable oils, offer a viable source of “green” energy that makes it attractive both economically and politically. However because the biofuels that are produced today come mainly from food-based products, this has caused a dramatic increase in food prices. Biofuels that come from food sources are known as first generation biofuels. The rise in global food prices has encouraged research into second generation biofuels which are produced from non-food based organics such as cotton seed oil, wheat and corn stalks (as supposed to the edible portions), and even poppy seed oil. As early as 2005, Tasmania, the world’s largest poppy cultivator, successfully created biofuels out of poppy seeds and demonstrated that their tractors could be run on biodiesel made completely from poppy seed oil (American Society of Landscape Architects, 2010). In late 2010, the U.S. Marines, in support of a biodiesel project in Helmand province in Afghanistan, were able to purchase biodiesel derived from cotton seed oil and blend it with JP-8 to run generators at Camp Leatherneck. They purchased the fuel at less than \$10 a gallon, as compared to the cost of transporting and protecting land delivered fuel to the war fighters at a cost of approximately \$400 per gallon (Schmidle, 2011). The demand for a local, cheaper supply of fuel would benefit both the Afghan economy as well as international military forces in country that are paying an exorbitant logistical price for security building.

The market extends beyond Europe, as the United States and China have begun to increase their alternative fuel automobile market and will become higher consumers of biodiesel. They are also becoming competitors on the world market for biodiesel sales. Spain and Canada are also emerging markets in the biodiesel industry (Thurmond, 2008). The growing demand and expanding biodiesel markets make a decision to move towards a biodiesel producing capability an urgent proposition for Afghanistan. There is time, however, to make this a viable possibility for Afghanistan to enter the market before supply reaches the demand. Figure 4 shows that the demand for biodiesel is increasing at a greater rate than production; however this trend is changing based on emerging markets.

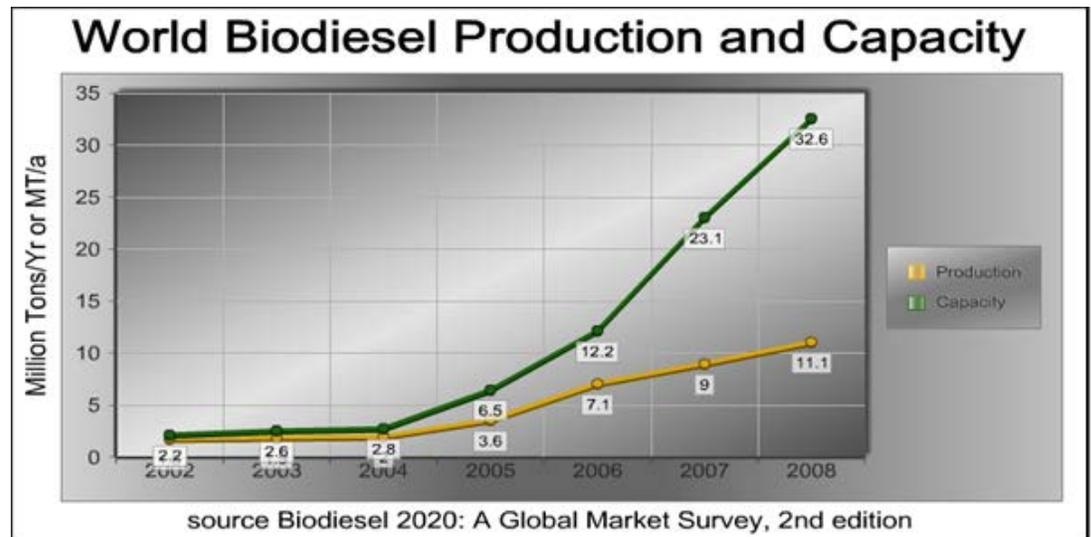


Figure 4 – World Biodiesel Production and Capacity (From Thurmond, 2008)

Why Poppy Biodiesel Works for Afghanistan

While there are options among different types of second generation feedstock to choose from, poppy offers some unique advantages that make it a good option in Afghanistan in particular. Poppy can be produced abundantly in Afghanistan due to a climate conducive to cultivation. Due to the high levels of opium poppy cultivation presently, there at least exists a work force that has the knowledge to cultivate and harvest the poppy. The particular variety that grows in Afghanistan, known scientifically as *Papaver somniferum*, relies heavily on manual labor to harvest the alkaloid rich latex that is extracted from the seed pods. To extract the latex, the seed pods are scored (scratched), allowing the latex to ooze out and then dry into a sticky residue which is collected manually by simply scraping and collecting the material. This can be done several times to each pod before it is emptied of the opium producing material. The remaining stalk is then useless in drug production and then is typically cut down and burned as fuel.

An opium-free poppy plant grows under the same conditions as its opium variety, and can likely be genetically modified in ways that would make them visually distinguishable. In using poppy plants for making biodiesel, the harvesting would be a simpler process where the seed pod itself is cut from the main plant and the oil pressed from the seeds and pod. The climate and the workforce are already present to cultivate poppy that could be turned into a useful source of energy.

The environmental impact of using poppy to manufacture biodiesel would be minimal for two reasons. First, it already exists and is grown in Afghanistan and therefore there is no need to introduce a different feedstock variety that is not proven to thrive in Afghanistan’s climate. Secondly, it is a source for highly desired second generation biofuel which allows food to be grown for the sole purpose of feeding the populace. Additionally, food crops typically use greater quantities of water to grow and using poppy eliminates potential future shortfalls due to biodiesel production.

Biologically, the poppy plant appears superior in the amount of oil that can be extracted per unit area of cultivated land. Poppy seeds provide outstanding oil to mass ratio, at approximately 45-50% as compared to canola at 40%. Other advantages of using poppy seed oil also stand out. Palm oil, which dominates most of the European biodiesel, has higher viscosity in colder weather compared to poppy seed biodiesel, which limits its use to blending with traditional petroleum-based diesel. The lower viscosity of poppy biodiesel would be compatible with European blends and allow for a greater ratio of biodiesel to petroleum diesel. In addition to the seeds which would be harvested for the oil, the remaining plant stalks can be used to create ethanol, which not only is an additive to existing petroleum products, but is also used to start the transesterification process which turns the fats in the seed oil into biodiesel. The entire plant therefore, provides a majority of the necessary ingredients to create biodiesel on its own (Larkin, 2007).

According to Dr. Larkin, approximately 0.8 tons of biodiesel per hectare of poppy can be produced (Larkin, 2007). 123,000 ha of poppy cultivated in 2010 would equate to 98,400 tons of biodiesel. While this equates to only 0.3% of the world demand and 0.8% of global production, this was achieved on 1.6% of available agricultural lands and would have provided a significant percentage of Afghanistan's energy usage (United Nations Office on Drug and Crime, 2010). A conservative estimate of energy that could be produced from 100,000 metric tons of biodiesel made from Larkin's production estimates, would equate to over 1,000,000 MWh of energy. Over 60% of the energy being used is imported from neighboring countries Tajikistan, Turkmenistan, Uzbekistan, and Iran. Based on the national power usage estimates in Afghanistan during 2010, this would have made up 38.7% of total demand, thus effectively reducing the import costs of energy by more than half (Afghan Energy Information Center).

The assumptions for the calculations above are:

- 100,000 metric tons of diesel = ~730,000 barrels
- 42 gal/barrel
- 138,000 BTU/gal diesel
- 1 BTU = 2.9e-7 MWh

The reasoning shows that biodiesel made from poppy is an option for improving the overall economy of Afghanistan by reducing its import energy costs. Increasing the amount of poppy production for biodiesel production will allow for Afghanistan to meet its own demand and could potentially expand in a way that Afghanistan could become competitive in the global biodiesel market.

Another economic benefit exists at the local level. Since poppy is a winter crop, it still leaves the rest of the growing seasons available for work. With varied crops, and thus sources of income, the impact of droughts and disease on the farmers is minimized. Recent history of the conflict in Afghanistan shows that the winter season is typically a slow period in insurgent operations because the fighters turn to farming during poppy season, and then return to the battlefield once the harvest is over. Keeping people employed year-round will take a more secure and economically viable environment, and thus it would still be critically important to see food crops being grown in addition to biodiesel poppy.

The cultivation of any biodiesel feedstock crop would support the policies of the U.S. Department by providing an option for the Alternative Development (AD) program which is managed by USAID. The AD program supports the Five Pillars of the U.S. government's counter-narcotics strategy in Afghanistan. The overall strategy is designed to reduce (and if possible eliminate) poppy cultivation for opium while strengthening the government of Afghanistan's ability to maintain control of the country. The opium market has a debilitating effect on the social and economic structures by providing a source of income to the Taliban and other terrorist organizations. The strategy is designed to augment the Afghan national government's strategy in combating opium production. However, this has proven a near impossible task due to the fluctuating levels of security throughout the country as well as corruption at every level of the government. This perhaps, is why eradication efforts have in the past played a prominent part in the counter-narcotics strategy because it seems to be a cheap way to bypass government interference. However, the eradication programs have been largely abandoned due to its failures to make significant reductions and thus a more AD program focus has been adopted.

Why Not Licenced Opium for Medicine?

A study conducted by The Senlis Council in 2005 examined the feasibility of legalizing poppy production in Afghanistan through licensed opium production for medicinal use. It too highlights the fact that a potentially valuable resource is being wasted by focusing on eradication and alternative crops, when it could be used for economic recovery and for a positive and licit use. The study points out a discrepancy between licit opium production (for morphine and codeine), actual usage worldwide, and the demand for these medicines in developing nations throughout the world. The arguments for licensing opium are that 1) current policy only provides short term economic solutions, 2) there are global pain needs that are unmet, and 3) that legalizing opium production would benefit Afghanistan's economy and security situation (The Senlis Council, 2005).

Current policy is actually focused on long term reduction of the opium trade; however the security and economic challenges have made it difficult to see the sustainability of the progress towards an opium-free economy. The use of alternative development programs have shown considerable progress in convincing farmers to switch from opium to food crops, as well as providing opportunities for work on other community development and national infrastructure projects.

If global demand is not being met, then clearly it is an issue that needs to be addressed. However, the study points out that the needs are not being met in some of the world's poorer nations, and specifically points to Eastern Europe and

Central Asia with epidemic HIV/AIDS problems. African nations would also be included. International law allows for the licit production of opium, which is a viable solution for Afghanistan, but only because of the current production levels in the country. The greatest challenge in meeting the demand through Afghanistan alone is the amount of controls and enforcement required, which presents an insurmountable task under the current security levels. Countries such as Tasmania, India, and Turkey which cultivate a majority of the world's poppy for opium do so under very sophisticated monitoring structures and have each developed a credible and internationally recognized licit source for opium. International support for legalizing opium production in Afghanistan would be underpinned by the prevailing security conditions and effective, corruption-free governance.

It is true that a legalized system of opium production could provide for increased economic opportunity for Afghanistan; however it is unclear whether the security situation would be improved in any way. If all of the opium could be intercepted upon harvesting, then it would indicate that licit production might be possible. However, currently this is not the case, meaning that even if some portion of the opium was harvested for medicinal use, the remainder would be continued to be used for illegal use, thus continuing the funding stream for insurgents. Also, based on lack of governmental controls and lack of effective law enforcement, it is likely that legal production would only provide another funding stream for corrupt government officials.

If pharmaceutical companies could establish themselves in Afghanistan, they would be a direct challenge to a source of income for Taliban insurgents, drug cartels, and other terrorist groups. On the one hand this reduces the illegal incomes for belligerent groups, but it also puts any companies involved at risk, not to mention the farmers. Until governance, security, and the economic situation is such that it resembles that of currently licensed opium producing countries, Afghanistan would not be a reliable source for medicinal opium.

Economy of Alternative Development

The efforts by USAID to boost the agricultural sector of Afghanistan's economy have been largely successful by doubling agricultural output in the last five years. They have provided direct support to the farmers by providing seed, fertilizer, improved harvesting tools, and education. Additionally, infrastructure improvements have been made such as improving the transportation routes, which allows for greater security to farmers bringing their produce to markets. They have also been involved with providing refrigeration and storage facilities as well as improved financing opportunities.

However, much remains to be done to improve the economic health of Afghanistan. In a recent self assessment it was pointed out that future funding of development projects is in question. It also discussed that some critical regions in Afghanistan were not even being addressed. If future funding disappears, thus rendering all the recent progress lost, then the momentum will shift direction and likely cause a shift back to an opium-based economy. A loss of critical development programs would also undermine security building in the nation, further prolonging the suffering of Afghanistan. It offers recommendations to ensure critical regions of the country get their fair share of development programs and also provides feedback on business practices to keep programs in motion. USAID, and/or other organizations, should continue to encourage alternate crop cultivation that provides financial incentives to growing opium poppy (U.S. Agency for International Development, 2010).

The main problem with convincing farmers to switch from opium-producing poppy to other agricultural products, whether for food or for biodiesel, is that ultimately no licit crop can compare with the greater financial payoff of opium. Where rule of law and security is strong, it becomes harder for the farmer to take the risk of growing an illegal crop, but in hard economic times, desperation usually wins over legality. Therefore, in addition to providing the secure and stable environment for the farmers, a legal crop that offers a chance at a decent living is not only desirable, but necessary.

Assuming \$10 USD/gal of poppy biodiesel, based on the cotton-seed diesel project in Helmand province, and also assuming 25% gets to the farmer, the price per hectare of biodiesel amounts to approximately \$1,225, which amounts to a 59% increase in income than from wheat in 2010. It should be noted that wheat prices went up during that year due to drought and subsequent food shortages in other wheat producing countries. Food prices are highly susceptible to environmental changes. Additionally, the use of food products in the production of first generation biodiesels further exacerbate the rising food prices on a global scale. Poppy-based biodiesels offer a diversified agricultural output that offers a great potential for increased financial gain directly to the farmers. It should be noted that the estimate provided for using poppy for biodiesel is grossly estimated and further market studies should be conducted, however it should be clear that poppy biodiesel can add to the growth of Afghanistan's economy.

Gross Income Per Hectare Comparison (USD)

Opium	\$4,900*
Wheat	\$770*
Poppy Seed Biodiesel	\$1,225

* From UNODC Afghanistan Opium Survey 2010

Poppy Biodiesel Production Roadmap

Biodiesel made from organic oils is an easy process, requiring limited ingredients and chemicals. One chemical that is associated with making biodiesel is methanol which is also used in making explosives. In order to minimize the potential of methanol being intercepted within the production chain of biodiesel, ethanol can be used instead. A great advantage of this substitution is that it can also be made easily from locally available ingredients. To make biodiesel, the

components are oil (extracted from the poppy seeds), ethanol, and potassium hydroxide (or sodium hydroxide). The availability of the ingredients may vary due to cost and location, however assuming that the materials are available, the simple process of making biodiesel could quickly expand and become profitable.

Two potential production models are proposed which could be implemented in order to make biodiesel production possible. In both cases, the cultivation of the opium-free poppy would be conducted at the village level. The cases differ in where the actual processing of the biodiesel would occur. Both cases have advantages and disadvantages, and ultimately a combination of the two may work depending on the local situation. The infrastructures required for both models are the same, but would be distributed differently and consist of the following: fuel trucks, pipelines (could tie into existing and/or future oil and natural gas pipelines), processing plants, and improved transportation routes. Additionally, the system would need fuel, chemical, and feedstock storage facilities at the processing plants.

In the first case, the cultivation of the poppy and processing and production of the biodiesel would occur at the village level. The farmer would cultivate the poppy seeds (for pressing out the oil) and stalks (feedstock for ethanol) which would then get fed into a local production facility. After processing, the biodiesel would be ready for delivery and the farmer/producer, likely a village co-op, would then receive payment from the delivering company who would then distribute the fuel to the end users directly or via a regional hub which could distribute the fuel via trucks or pipeline.

The advantage of village-level co-op cultivation and fuel production is that employment is kept locally. This provides the greatest economic gain to the local producers without diminishing profits through middle men. As production levels increase and mechanization of the harvest can be conducted using biodiesel run tractors, the farmers would have a supply of biodiesel readily available. However, a great number of processing plants would have to be built and maintained throughout the country if large scale national production was to be attained. It requires transportation of the volatile fuel in areas where there might not be well-maintained or even paved roads. It also requires that the processing ingredients which cannot be made locally be delivered to the farmers along the same roads further increasing transportation costs. The overall security situation in the country would also have an impact along transportation routes, but this would be the case in either model. Since the biodiesel production is supposed to boost the economy while creating jobs and profiting the farmers, it also provides a source of income to the government through taxes. The challenge would be for the current government of Afghanistan, to manage and enforce the taxation of the fuel at the village level.

In the second case, the village co-op would be responsible only for cultivating the poppy harvest. The poppy feedstock would then be transported to a regional processing center which would be fed from multiple villages. The final fuel product would then be delivered from the processing center which would also act as the transportation hub to regional and national end users. A variation of the model could have the co-op also conduct the oil pressing and ethanol manufacturing to be delivered to the processing plant.

In this case, an advantage is that the farming village focuses on farming, while the processing and transportation of volatile fuel is conducted in areas that are presumably more developed and with higher levels of security. The government also has a better opportunity to regulate its income through taxing and sales of the biodiesel. Here, a debate surfaces whether the fuel processing in this case would be owned and operated by the government or through private industry. Financially, the farming co-op will likely be disadvantaged as compared to the owners of the processing plants (whether government owned or private); as they will be lower on the profit ladder. The burden of the transportation costs would be passed down to the farmer.

Challenges for the Way Ahead

This article provides only a quick snapshot of what the production chain might look like, but does not include a rigorous economic assessment. The only way any biodiesel production chain can be successful, is for it to have a kick-start with sufficient upfront investment. Also, every segment of the production chain needs to generate a sustainable measure of profit. This is the main concept for the Alternative Development programs. A financial system has to be in place so that farmers do not fall back into a "cycle of debt."

Afghanistan has many challenges to overcome to become a stable economy, not least of which is the continuing insurgent violence which hinders the ability for the United States, ISAF, and other NGO's from enabling and sustaining peace in all regions of the country. The weakened security situation is the primary obstacle to economic stability. Poor infrastructure limits the rapid reconstitution of the Afghan economy, requiring massive investments which are thwarted by mismanagement and corruption. The political will of Afghanistan and its ISAF partners is also paramount in sustaining current and future development. Improving law enforcement, reducing corruption, and increasing the legitimacy of the central and local governments is necessary for the development of any Alternate Development project, and especially so in the creating of a poppy-based biodiesel industry.

The regions where the greatest poppy cultivation (for opium) occurs are also the regions where the security situation is the worst. It might be too difficult to attempt a switch to non-opium producing poppy for biodiesel in these areas. Rather, getting the industry started would require a higher level of security to allow for the infrastructure and development to occur without interference. Enforcement would be critical in ensuring that the poppy being cultivated is the opium-free variety, and could be done with random checks within a growing area and would only have to be performed once. The farming communities and the processing plants would have to retain a minimum level of security that would deter insurgents and drug cartels from intimidating or performing retaliatory violence against non-opium growers of poppy. It

would be necessary to develop this new biodiesel producing capability in more secure areas of the country.

The largest initial investment in developing a biodiesel industry is creating the infrastructure necessary for the cultivation, transport, and processing segments of the production chain. Due to the lack of effective domestic financing schemes, foreign aid would likely be required to provide the initial investments by providing the necessary seeds, fertilizers, and education required. The expertise in cultivating the non-opium poppy crop is no different than the illicit version, however the producers of the biodiesel would need initial training on the processing and handling of the biodiesel products. Overall strategic planning is required for ensuring the logistical component of the supply chain is in place, for example choosing locations for the processing plants and transportation hubs to better meet the end user demands. Also, since utilizing trucks incurs additional fuel costs, pipelines to deliver biodiesel to locations around the country could be considered, taking into account the geography and security situation.

On the issue of politics and governance, it would take a strong information campaign to prove to domestic and international organizations that a non-opium producing poppy would provide an economically viable energy solution, while also combating the opium production problem in Afghanistan. Unfortunately, poppy is deeply engrained in the minds of many people as a source for drugs, whether licit or illicit. Biofuels offer very economic and environmental-friendly energy solutions, regardless of the source. However, the information campaign should focus on a few aspects of why poppy based biodiesel is the best option for Afghanistan. First of all, regional climate is conducive for the cultivation of poppy without adding stress to the existing agricultural water supplies. Other potential biodiesel crops are large consumers of water. Second, the biodiesel crop in Afghanistan should be a second generation biofuel so as not to hamper food production by adding significant demands on water supplies. Afghanistan has again begun to take on its traditional agricultural role where food crops dominate. They have a long way to go, but using food crops for fuel would only diminish the progress they have made thus far. As long as the poppy being cultivated is of the non-opium variety, it should not negatively impact the security of Afghanistan and would limit a funding source for insurgents and drug cartels.

Questions remain, however, in fully assessing the viability of using poppy as a biodiesel source. Is it possible that growing the opium poppy could provide a double source of income, both licit and illicit? Is it possible that after the opium latex is harvested from the seed pods, that the seed pods could still be used to extract the oil required to make biodiesel? What about the possibility that the Taliban or other "warlords" could still acquire funding by extorting money from the farmers and producers by guaranteeing "protection" services? What about government corruption? In answer to the first two questions, it falls upon central government and regional security forces to be able to offer legitimate protection to its citizens. Verification and oversight is required, but not to the extent that is required for licit production of opium for medicinal purposes. As far as corruption, this is a problem that has the potential to permeate all economic sectors in Afghanistan and is a problem that needs to be continually addressed.

Conclusion

The economic and strategic interests of Afghanistan need to be taken into account when examining possible solutions to illegal opium. The opium trade not only affects the efforts of ISAF and the United States in accomplishing their mission of restoring peace. The international community suffers as well with the challenges of interdicting the sheer amount of drugs being smuggled worldwide. It is a frustrating fact that while 90% of the world's opium is produced in a single country, opium production cannot be destroyed with the concentrated efforts of the United States and its partners. Additionally, it poses a distraction to security building where efforts should focus on defeating the Taliban insurgency and terrorists rather than upsetting the livelihood of poor farmers, further complicating the progress of security building.

The effects of opium production have had a debilitating effect on Afghan society as well as on the effectiveness of the government in implementing rule of law. A paradox exists between reducing opium production and establishing rule of law and increasing security. Increased governance and law enforcement are required to effectively combat the drug industry. However, as long as the opium trade continues to provide funding for corrupt officials as well as insurgents, then governance and rule of law are essentially crippled. Non-opium poppy cultivation for energy offers a way to break out of this cycle in an economically and socially beneficial way.

It is easy to criticize current policies on counter-narcotics strategies in Afghanistan when the expected results do not meet certain expectations, especially when the expectations are too high. The opium agriculture base is deep-rooted and has systematically damaged the social and economic fabric of an entire nation. It is a wound that will take time to heal, but it requires the commitment and resolve of the Afghan people as well as the rest of the international economic community to do so. There are no "silver bullet" approaches to eliminating the opium cultivation problem in Afghanistan. While continuing to engage in multi-layered counter-narcotics strategies, the focus should also consider the well-being of the Afghan people. Non-opium poppy biodiesel offers a unique opportunity for Afghanistan to play a part in the global future of green energy while boosting its economy and improving the overall welfare of its people.

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