Biofuels for Aviation Summit (September 1-2, 2009)
Session – Feedstock logistics / **Panelist Sam Tagore, DOE** / Topic:Food vs. Fuels Issues
**How does feedstock logistics relate to location of production issues ?**

- Feedstock logistics deal with the flow of cellulosic non-food biomass feedstocks and other related ingredients from the place of their production to biorefineries. These activities include options for collection, storage, preprocessing (size reduction, drying, sorting, mixing, densification), and traportation. Logistics have a close connectivity with feedstock production on one hand and feedstock interface with chemical conversion to biofuels on the other hand.

- The physical and compositional characteristics of raw biomass has a great influence on feedstock logistics both in terms of costs and infrastructure requirements. Among feedstock characteristics, the format of biomass and its moisture content will set the stage for organizing the optimum way of harvesting and handling of feedstock from production site to its point of use.

- The location of feedstock production in relation to the location of its use has profound effect on cost and environmental impacts of feedstock logistics. The farm gate cost of producing feedstock can be minimized by designing and deploying innovative equipment. The transportation cost is difficult to control unless the production site and the biorefinery site are logistically located such that to allow the use of lower cost transport options such as rail and water ways.

- The current handling systems developed for forages and straw (mainly baled biomass) can be used to supply limited quantities of biomass (~ 100,000's tons of biomass annually) for pioneer biofuel production. But, as the size, number, and capacities of biorefineries increase (millions of tons of feedstocks), the existing handling systems will not be economical and environmentally sustainable. OBP-DOE has focused to develop uniform-format handling systems by which biomass is granulated/densified for its efficient handling.

- Under advanced uniform-format concept, much of the preprocessing of biomass including densification-granulation would take place at the farm gate. This will reduce the overall cost of handling and transporting biomass as compared to having these processes to take place in a centralized location. Centralized locations (depots) have proved efficient in preprocessing of agricultural crops/grains, but may not solve the issue of vehicle traffic handling bulk density biomass from field to the depot.

- <u>Forest residues</u>: Current environmental and sustainability issues make it uncertain as to the amounts of biomass residues that could be collected from agricultural lands. With that perspective, it appears that cellulosic biomas from forest lands would be a prime source of cellulosic biomass supply (Healthy Forest Act). Handling of woody biomass from forest is quite different in nature than that of herbaceous agricultural biomass. There is a need to integrate woody biomass

supply system from forest and herbaceous biomass from agricultural lands in the light of Uniform Format Biomass Supply.

**What is the role of feedstock logistics in the food/fuel debate ?**

- The increased volume of biomass handling will create new demands on equipment that are already used for handling food crops. This might translate into increasing the cost of handling, storage, and transporting food crop.

- For the case of using crop residue, a producer have to deal with two crops, grain and biomass. Field harvest and removal of these two crops often happen concurrently. The producer will be extremely busy harvesting food crop but also have to deal with non-food biomass if he/she is also committed to biomass. A producer may elect to give priority to harvesting biomass if the financial return from biomass reaches or surpasses those from food crops.

- Logistics also deal with the quantity of biomass removed from a field. Harvesting equipment are adjusted to removing biomass quantities that would not harm soil fertility and quality. The level of removal will affect productivity of the land to produce food crops.

- Biomass for Aviation Biofuels: Current biomass logistics work is primarily based on bioethanol production. Feedstocks for aviation biofuels could be completely different (such as algae, jatropha, etc for bio-oil/biodiesel, etc) requiring entirely different approach.

**How can the Air Force contribute to the developments in technology, organization and policy that would accelerate the biofuels industry ?**

- Aviation industry including Air Force has wide experience and technology in logistics of material movement. Sharing models and know-how with the biomass supply community is one way of advancing bioenergy feedstock logistics.

- Aviation industry can develop a precise specification on the type of fuels required for aviation equipment. This would help the biorefiners and supply logistics engineer to design the process to make the production of specific fuels economical with a lesser environmental footprint. Aviation industry could strive for increasing the RFS mandate for aviation biofuels.

- Solid biofuels (biomass pellets) can be used for small scale heat and power generation. These fuels can be used at Air Force installations especially those in remote applications. The use of solid biofuels will assist in an early development of logistics especially when biofuels production from cellulose has yet to be fully commercialized.