MIE 1620 Computational Project (Due by Dec. 12th by 5PM.)

In this assignment you will solve the farming stochastic programming model (see the slide deck *farming sto pro* in Files) using various solutions methods.

[1] The first method to use is the simplex method as developed in class. So you need to implement this algorithm from scratch using MATLAB. It is important not to explicitly compute the inverse of a basis matrix but instead solve the equivalent linear system of equations in each iteration.

[2] The second method is to use the Dantzig-Wolfe decomposition as developed in class. So you need to implement this from scratch. For solving the LP sub-problems you can use an industrial strength LP solver like linprog in MATLAB.

[3] The third method is to use an industrial strength simplex solver like the linprog function in MATLAB or the LP solver from Gurobi or CPLEX.

The goal is to solve the stochastic programming farming problem but with a large or sufficiently large number of scenarios. The number of scenarios is up to you but should be large enough such that your Dantzig-Wolfe method might be competitive or even better than solving the stochastic farming problem using your simplex implementation from [1]. It would be excellent if your Dantzig-Wolfe outperforms the LP solver from [3] (this would a bit challenging.) It will be important for you to write auxiliary code that generates the coefficients for the stochastic programming farming model since entering such data manually will not be efficient. You have considerable flexibility in generating the scenarios and can assume each scenario is equally likely.

Deliverables: You must write a report that containts information about how your stochastic programming model was formulated i.e. explain how the scenarios were generated. The report must also contain results from solving your stochastic programming model using the various approaches in [1], [2], amd [3]. The results should document how long it took to solve the model for each approach as well as noting any differences in solution quality. Compare the results from the three different approaches. Please make your report easily readible and well-written and use tables, graphs, or visual aids to communication your results. In an appendix show your code that you wrote for [1] and [2]. Use good programming practice such as commenting your code. Do NOT use in any way shape or form pre-existing code to do [1] and [2] as this would be in violation of the honour code.

This project can be done in groups of up to two persons. Groups with more than 2 persons is strictly forbidden. If there are two persons in a group then each person must given a statement of what was contributed by each student.

Instructions for handing in the project: Put your report and your code in a .zip file and e-mail to rkwon@mie.utoronto.ca and write the subject of your e-mail as "MIE 1620 Project <name>" e.g. "MIE 1620 Dantzig Wolfe". Send your project to Prof. Kwon by Dec. 12th 5PM EST.