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MINIMIZING THE COST OF MIXED FERTILIZERS AND LOCATION OF BULK BLENDING PLANTS

Part A

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Part A

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In previous lectures you have heard about the different types of bulk blending plants and how they are used to produce dry-mixed granular fertilizers. The entire flow of materials in the bulk blend marketing system is depicted in Figure 1. In this marketing system basic producers produce straight-nitrogen products such as ammonium sulfate (20 percent nitrogen), ammonium nitrate (33.5 percent nitrogen), and urea (46 percent nitrogen). They produce straight-phosphate products such as normal superphosphate (20 percent P_2O_5), triple superphosphate (46 percent P_2O_5), and concentrated superphosphate (54 percent P_2O_5). They also produce N-P products such as ammonium sulfate phosphate (16-20-0), ammonium phosphate nitrate (30-10-0), and diammonium phosphate (18-46-0). The remaining basic producer produces only one grade of potash (0-0-60).

Almost all these products are shipped in granular form to the blender. There are other products such as potassium nitrate and sodium nitrate and some N-P grades such as 16-48-0, 28-14-0, 11-52-0, 25-25-0, 26-13-0, and 20-20-0 that are also shipped to and used by blenders; however, these materials amount to only a small percentage of the total quantity of materials shipped to blenders. The blending plant is usually located in the use area, and it usually services farms within a 50-mile radius of the plant.

Figure 1 shows that the phases of the bulk blend marketing system are:

1. Production by basic producer
2. Ocean and/or rail freight from basic producer to bulk blend plant
3. Mixing at bulk blend plant
4. Trucking to the farm
5. Application of fertilizer on the farm

Each phase represents a cost. It is the responsibility of the blender to determine which combination of all these costs for each material considered will give him the lowest cost of plant nutrients mixed, delivered, and applied on the farm.

The price of materials at the basic producer's plant is important; however, the delivered price of these materials to the blend plant is more important. The blender must determine what combination of materials will give him the least cost per unit of plant food delivered to the farm. Mr. Walkup will discuss our least-cost linear program which assists the blender in making this decision.

The flow diagram shows that considerable transportation and handling costs are involved in the bulk blend marketing system. In recent years the blender has tried to decrease these handling costs by using higher-analysis materials. It is not very uncommon in this country now to see the use of urea by a blender. Figure 2 shows how radically the freight cost per unit of plant food is decreased when the blender changes from the use of ammonium sulfate to the use of urea. Figure 3 shows the same significant effect when the blender changes from normal superphosphate to concentrated superphosphate.

In the United States normal superphosphate usually costs less per unit of plant food at the basic producing plant; however, this cost advantage over the higher-analysis materials is soon lost as this low-analysis material is transported from the basic producer to the blender. TVA is now developing and using in their field programs a concentrated superphosphate which has a slightly higher production cost than the other conventional superphosphates. Its transportation and handling cost, however, is lower than that for any other superphosphate.

Another advantage in using higher-analysis materials is that from them mixtures of higher analyses can be produced. For example, when normal superphosphate (0-20-0), ammonium sulfate, and potash are used, the highest-analysis grade with a 1:1:1 ratio that can be produced is about 9-9-9, whereas if urea (0-54-0), diammonium phosphate (18-46-0), and potash are used, the grade is about 19-19-19.

Let us refer to Figure 1 again. It can be seen that the production of a high-analysis grade is important to a blender, because his handling and other fixed cost per unit of plant food is lower for a higher-analysis mixture. For example, the average fixed and handling cost for a typical bulk blend plant is about $15 per ton of fertilizer. If he were producing the lower analysis, 9-9-9, mentioned above, then his fixed cost per unit of plant food would be $15 divided by 27 or $0.55 per unit. However, if he should produce a high-analysis grade, 19-19-19, then his fixed cost per unit of plant food would be only $0.26 per unit or about 50 percent as much as that of the low-analysis grade.

If you will again refer to Figure 1, you will see that he would also save on the trucking cost to the farm, and the farmer would save on application costs. The blender, who is in the center of this marketing system, must be an excellent business man and must consider the following:

1. What are the delivered costs of materials to me?
2. What are my fixed and operating costs?
3. What is the least-cost mixture I can make from these materials?
4. Can these least-cost mixtures be delivered to the farm at the lowest cost?

The best combination of these items will provide him his best sales program, and this is usually the best economic program for the farmer. Mr. Hargett will now discuss how TVA assists the blender in determining the least-cost mixtures which the blender can produce from materials available to him.

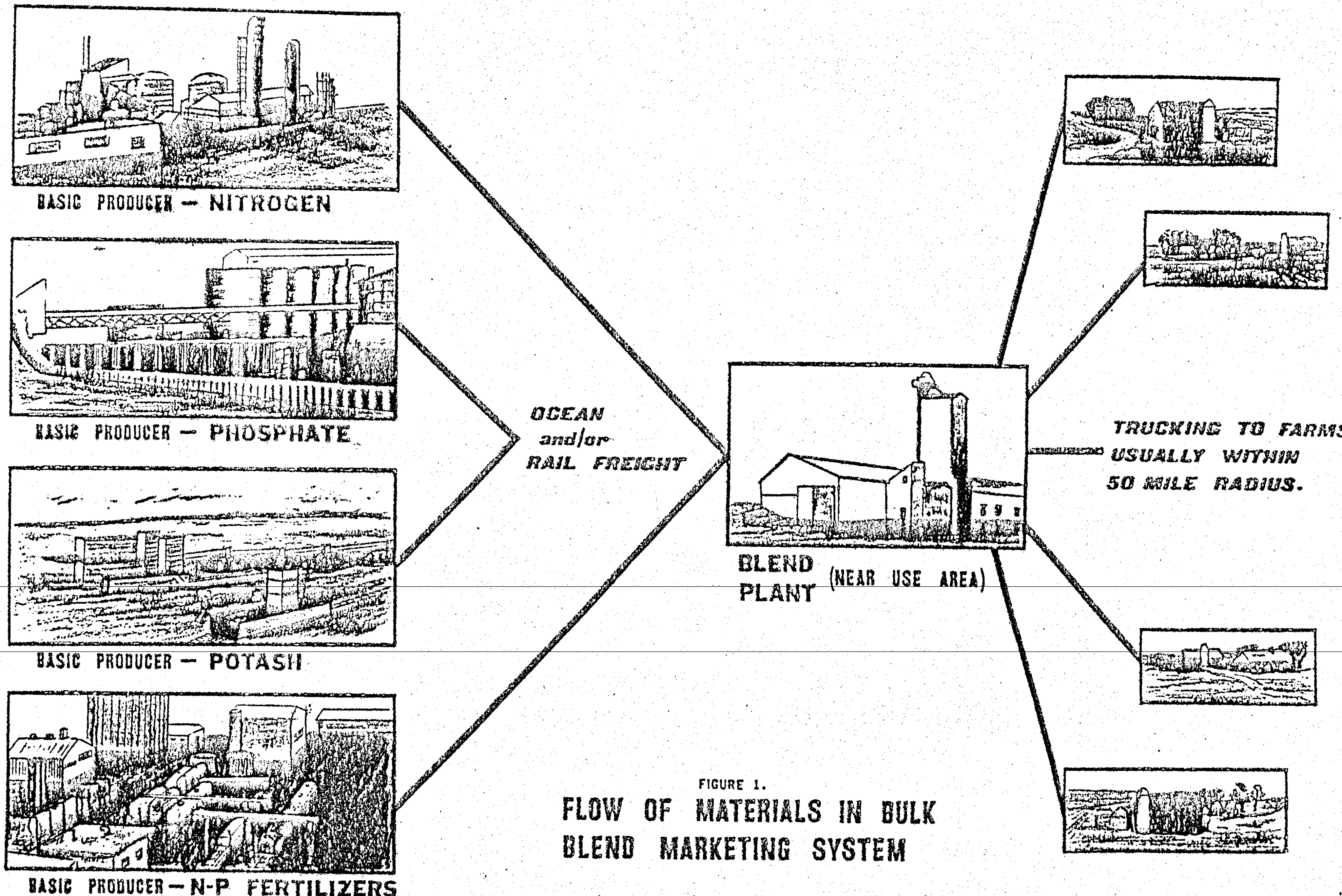

FIGURE 1.

FLOW OF MATERIALS IN BULK BLEND MARKETING SYSTEM

FIGURE 2

STRAIGHT NITROGEN MATERIALS EFFECT OF PLANT NUTRIENT CONCENTRATION ON RAIL FREIGHT COST PER UNIT OF PLANT FOOD

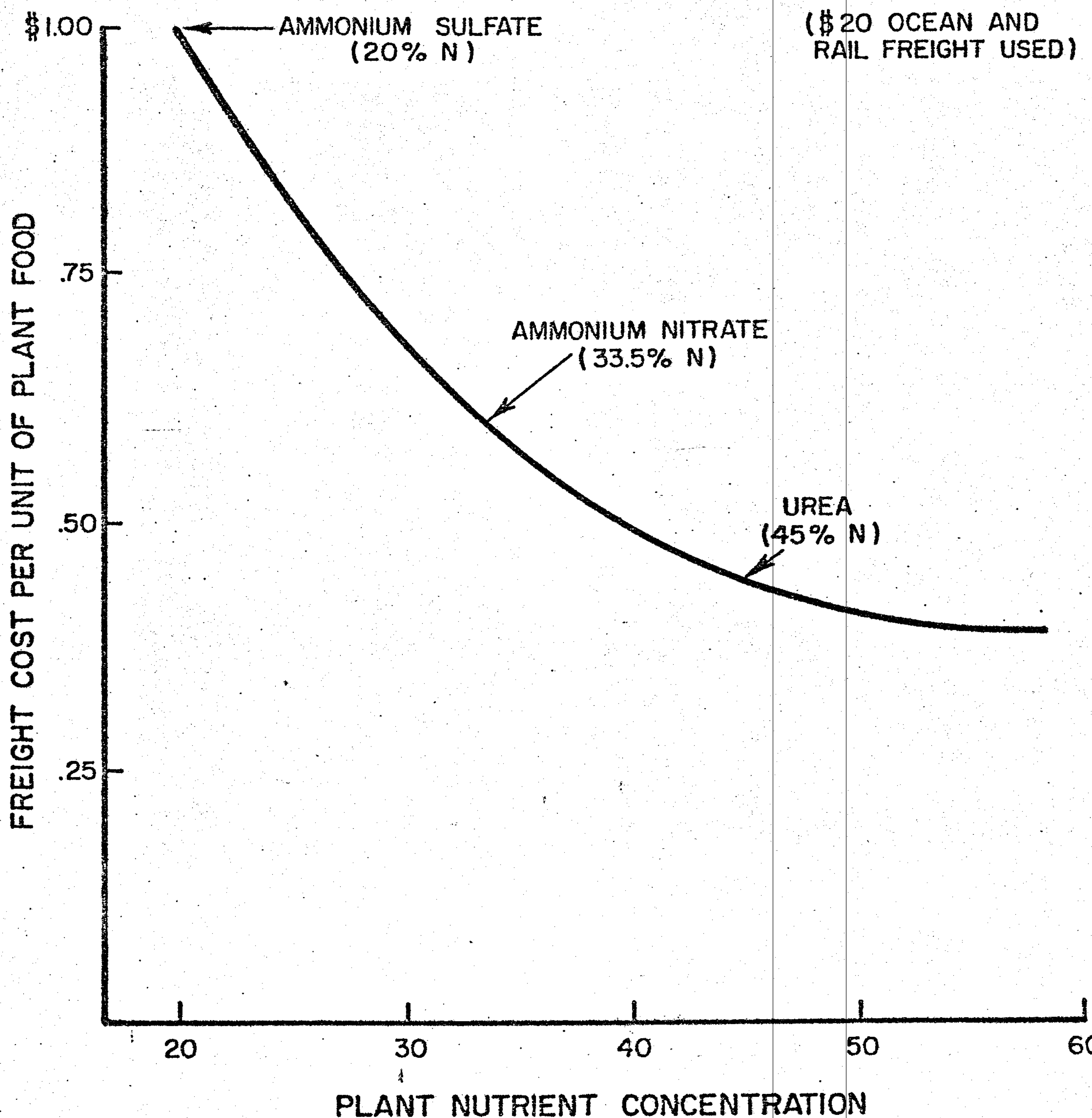

FIGURE 3

STRAIGHT PHOSPHATE MATERIALS EFFECT OF PLANT NUTRIENT CONCENTRATION ON RAIL FREIGHT COST PER UNIT OF PLANT FOOD