Background information for the sample problem handout:

August, 1994

BY-PRODUCT INFORMATION:

A snack food processor has contacted the farmer because they are interested in reducing their disposal costs.

The by-product is potato chips.

A nutrient analysis was done to determine dry matter, digestible energy, crude protein, crude fat, crude fiber, ash, and mineral content of the by-product

The chemical analysis found that there were no pesticides, herbicides, or non nutritional compounds in the by-product

2400 lbs of potato chips are available every 5 days

The snack food processor has adequate indoor storage capacity to hold seven days worth (3360 lbs) of by-product

FARM INFORMATION:

The farm is an 800 hog growing and finishing operation.

Feeder pigs are purchased at 50 lbs and raised to market weight.

The farmer will incur a transportation cost of $ 0.80 / mile to transport the by-product

The farm is located 5 miles from the food processing plant

The farm has adequate indoor storage capacity to hold 10 days worth (4800 lbs) of the by-product

DIETARY INFORMATION:

A hog needs 5 pounds of feed a day

Potato chips are limited to 12% (0.6 Lbs) of the hogs diet because of the high salt and high fat content of the material

Because of the high salt content, adequate water must be supplied to the hogs at all times

Because of the high fat content, the feed may not flow through the feeders. This problem can be prevented by pelletizing the feed.

SAMPLE PROBLEM FORMAT

PROBLEM SOLUTION:

Layout of plan...

Steps	Key Points
1. Obtain a nutrient analysis (as is basis)	1.1 % dry matter
	1.2 % digestible energy
	1.3 % net energy
	1.4 % crude protein
	1.5 % either extract
	1.6 % fiber (crude fiber, acid detergent fiber)
	1.7 % ash
	1.8 % minerals (% CA, % P, % K, % MG)
	1.9 % salt
2. Obtain a chemical analysis	2.1 check for pesticides present in by-product
	2.2 check for herbicides present in by-product
	2.3 check for other possible anti-nutritional factors (i.e. mycotoxins, excessive salt, rancid fat, excessive copper sulfate)
3. Determine the availability of the product	3.1 quantity
	3.2 frequency (daily, weekly, bi-weekly)

4. Determine the logistical factors	4.1 food processors storage capacity
	4.2 food processors ability to keep product fresh
	4.3 cost of transportation
	4.4 distance to feed lot
	4.5 farm storage capacity
5. Choose a nutritionist	5.1 U of M faculty extension nutritionist
	5.2 U of M extension educator
	5.3 nutritional consultant
	5.4 feed company representative
6. Formulate a ration	6.1 animal daily feed intake needs
	6.2 limits/ restrictions of by-product use
	6.3 typical conventional feeding program
	6.4 additional nutrient concerns or decisions when feeding by-product
7. Calculate feed costs	7.1 total cost of traditional 16% protein ration (/pig/day)
	7.2 modification costs of traditional ration to incorporate by-product
	7.3 traditional ration costs plus modifications costs (/pig/day)

7.4 cost of by-product (/pig/day)

7.5 cost of pelletizing complete feed (/pig/day)

7.6 total cost of ration supplemented with by-product (/pig/day)

7.7 feed cost comparison, traditional vs. by-product (potential herd savings/ losses)

8. Calculate facility modification costs

8.1 watering system

8.2 feeders

8.3 on farm storage

8.4 grinders-mixers

8.5 augers

8.6 additional facility maintenance/ management due to changing feeding program

SAMPLE PROBLEM HANDOUT: POTATO CHIPS

Steps	Key Points
1. Obtain a nutrient analysis (as is basis)	1.1 dry matter = 90%
	1.2 digestible energy = 5250 Kcal/Kg
	1.3 Unknown
	1.4 crude protein = 6.5%
	1.5 crude fat = 30%
	1.6 crude fiber = 1.2%
	1.7 ash = 3.7%
	1.8 minerals CA = .02% P = .05% K = .39% MG = .03%
	1.9 salt = 5%
2. Obtain a chemical analysis	2.1 no pesticides present in by-product
	2.2 no herbicides present in by-product
	2.3 no anti-nutritional factors present in by-product
3. Determine the availability of the product	3.1 2400 lbs of by-product are available
	3.2 by-product is available every 5 days

4. Determine the logistical factors

4.1 food processor has adequate indoor dry storage capacity for 7 days = 3360 lbs

4.2 food processor can keep product dry and fresh for 7 days

4.3 transportation cost = .80/ mile

4.4 distance to feed lot = 5 miles

4.5 farm can store 10 days supply of by-product = 4800 lbs

5. Choose a nutritionist

5.1 U of M faculty extension nutritionist

6. Formulate a ration

6.1 a hog needs 5 lbs of feed/day

6.2 potato chips can make up 12% of the diet
= .6 lb/pig/day (12% of the 5 lbs daily diet = .6 lb)

limit is set because of concerns over high salt and high fat content of the by-product

6.3 16% protein, corn and soybean totally mixed ration with vitamin and mineral supplements

6.4 adequate water must be available at all times because of the high salt content of the by-product

because of high total fat in feed, there is a feed flowability concern. therefore, we have decided to pelletize the feed.

7. Calculate feed costs

7.1 cost of traditional ration:

cost of corn and soybean meal ingredients in a 16% protein ration
= $120.00/ton

cost of mixing feed
= $20.00/ton

cost of adding vitamins and minerals
= $11.00/ton

total cost
= $151.00/ton
/ 2000 lbs/ton
= $0.0775/lb
x 5 lbs (from 6.1)
= $0.3775/pig/day

7.2 modification costs:

savings from not adding salt to by-product ration
= $0.35/ton (10 lbs of salt removed/ ton at $.035/lb)

cost of adding protein to by-product ration (2% increase)
= $7.00/ton

when dealing with diets containing high levels of fat, it may be necessary to formulate a higher protein (lysine) diet than the traditional ration in order to achieve comparable growth performance

total feed modification costs
= $ 6.65/ton

7.3 cost of traditional ration with modifications:

cost of traditional ration
= $ 151/ton (from 7.1)

modification costs
= $ 6.65/ton (from 7.2)

total
= $157.65/ton
/ 2000lbs/ton
= $0.0788/lb
x 4.4 lbs (88% of the 5lbs
daily diet = 4.4lbs)
= $ 0.3467/pig/day

7.4 cost of by-product

potato chips are free but
farmer provides transportation
which costs $0.80/mile
therefore, $0.80 x 10 miles
(round trip)
= $8.00/load (2400/lbs)
$8.00 / 2400
= $0.0033/lb
x .6 lb (12% of 5 lbs daily
diet = .6 lbs)
= $.0020/pig/day

7.5 cost of pelletizing
= $10.00/ton
/ 2000lbs/ton
= $0.005/lb
x 5 lbs (total daily intake)
= $0.025/pig/day

additional travel expenses may be incurred in pelletizing the feed if the mill mixing the ration cannot provide this service

7.6 total cost of ration supplemented with by-product
= $0.3467 (from 7.3)
+ $0.0020 (from 7.4)
+ $0.0250 (from 7.5)
= $0.3737/pig/day

7.7 feed cost comparison:

traditional ration
=.3775/pig/day (from 7.1)
x 800 pigs
= $302.00/day feed cost

by-product ration
= $0.3737/pig/day (from 7.6)
x 800 pigs
= $298.96/day

potential saving/day
= $302.00 - $298.96
= $3.04 saving/day
x 365 days
= $1109.60 potential
saving/ year

this assumes that the carcass quality is the same

8. Calculate facility modification costs

8.2 none
pelletized feed can be used with available feeding equipment