Ref: Pond, W. G. and Maner, J. H. 1984. Swine Product and nutrition. Printed in the USA.

TABLE 12.50. Effect of Lysine Supplementation on the Utilization of Distillers' Dried Grains with Solubles (DDG/S) by Growing-Finishing Pigs

Level of DDG/S, %	*0*	*20*	*20*	*20*
Level of lysine supplementation, %	*0*	*0*	*0.15*	*0.25*
Av daily gain, kg	0.79	0.61[a]	0.73	0.73
Av daily feed, kg	1.61	2.40	2.53	2.54
Feed/gain ratio	3.34	3.94[b]	3.48	3.49

Source: Wahlstrom et al. 1970.
[a,b]Means on the same line with different superscripts are significantly different.

generally higher than that of the original grain. Ewan (1976) reported a me bolizable energy value of 2940 kcal/kg for distillers' dried grains with solub which is somewhat less than that of maize (3320) and soybean meal (3130). Thi because of its relatively high fiber content (8.5–9.0%) and the pattern of am acids, the dietary level of distillers' dried grains with solubles for growin finishing swine should be limited to 10–15% or a maximum of 20% wh supplemental lysine is added. Under most conditions, grains rather than their b products will be a more economical source of energy.

Distillers' dried grains with solubles have been shown to be a useful feed f gestating swine. Thong *et al.* (1978) demonstrated that a dietary level of 44.7 distillers' dried grains with solubles could substitute for all of the soybean me and a portion of the maize without affecting gilt gain or reproductive perfo mance. Even at this level of substitution in which the distillers' dried grains wi solubles supplied 68% of the total dietary lysine and 44% of the total metaboliz ble energy, average gestation gains, litter size, and weight at birth were similar those obtained when a 11.4% crude protein maize–soybean meal control di containing 0.42% lysine was fed. Absolute daily nitrogen retention from t 44.2% distillers' dried grains with solubles diet was equal to that from the contr diet, indicating that the lysine from this distillery by-product was apparentl highly available.

Brewery By-products

The brewery by-product, dried brewers' grains, is a bulky, low-energy fe containing 96.7% dry matter, 28.5% crude protein, 6.1% ether extract, 19.1 crude fiber, 3.6% ash, and 39.4% nitrogen-free extract. The protein has be shown to be 72.4% digestible and the digestible energy, metabolizable energ and metabolizable energy corrected for nitrogen to be 2650, 2500, and 23 kcal/kg DM, respectively, with only 52.3% of the gross energy being digestib (Kornegay 1973). The amino acid content of brewers' dried grains is shown Table 12.51.

Young and Ingram (1968) used dried brewers' grains as a replacement f soybean meal in the diet of growing-finishing pigs. Levels of 0, 25, 50, 75, an 100% of the supplemental protein or 0, 11.4, 23.3, 34.0, or 52.4% of the di

TABLE 12.51. Amino Acid Content of Brewers' Dried Grains

Item	*Source 1*[a]	*Source 2*[b]
Aspartic acid	1.76	1.78
Threonine	1.01	0.97
Serine	1.20	1.39
Glutamic acid	4.28	6.05
Proline	2.91	2.28
Glycine	1.06	0.94
Alanine	1.64	1.72
Valine	1.24	1.44
Cystine	0.28	—
Methionine	0.51	0.58
Isoleucine	1.71	1.95
Leucine	2.82	3.22
Tyrosine	0.95	1.22
Phenylalanine	1.57	1.44
Lysine	0.76	0.63
Histidine	0.67	0.57
Arginine	1.28	1.09
Tryptophan	—	0.25

Source: [a]Kornegay 1973; [b]Brooks 1971.

supplied by dried brewers' grains. There were no changes in average growth r carcass quality of pigs given up to 50% of the supplemental protein, but brewers' grains supplied more than 50% of the supplemental protein, there tendency for both gains and feed efficiency to decline. The effect of the on of increasing levels of brewers' grains was most pronounced during the th period, where both gains and feed efficiency were linearly depressed with increase in level of brewer's grain. Similar studies by Baird *et al.* (1975) ed 0, 25, 50, and 75% of the soybean meal in 15% protein maize–soybean diets for growing-finishing pigs. It was shown that at levels of more than substitution, lysine became limiting and caused significant reductions in daily gain and efficiency of food conversion. Nigerian studies have shown placement of maize by 5, 10, or 15% brewers' dried grain in diets based on , peanut meal, and blood meal had no effect on pig performance or efficien- feed utilization (Babatunde *et al.* 1975).

wo trials with growing-finishing pigs, one in winter and one in summer, nwell *et al.* (1979) used brewers' dried grains containing 22.4% protein and lysine to substitute maize and soybean meal on an isolysine basis at levels , 10, 15, and 20%. Pooled data from the two trials (Table 12.52) indicated dratic reduction in growth rate and a linear increase in feed/gain with ing level of brewers' dried grains. The authors concluded that up to 15% rs' dried grains could be included in maize– soybean meal diets for grow- ishing swine without depressing growth; however, feed required per unit of ncreased progressively with increasing levels of brewers' dried grains.

TABLE 12.52. Effect of Dietary Level of Brewers' Dried Grains (BDG) on Performance of Growi Finishing Swine

Level of BDG, %	Summer		Winter		Pooled	
	ADG,[a] g	Feed/gain	ADG, g	Feed/gain	ADG, g[b]	Feed/g
0	798	3.18	687	3.59	742	3.38
5	772	3.21	730	3.59	751	3.40
10	771	3.24	722	3.65	746	3.44
15	770	3.30	703	3.71	736	3.51
20	704	3.44	681	3.78	692	3.61

Source: Cromwell et al. 1979.
[a]Average daily gain.
[b]Significant quadratic reduction in growth rate.
[c]Significant linear reduction in feed/gain.

Although Young and Ingram (1968) reported that the proportion of dri brewers' grains had no effect on gains during the finishing period, Werner an Schellner (1960– 1961) demonstrated that feeding wet brewer's grains to finis ing pigs (53–115 kg) reduced gains by 15.5% and increased both intake p kilogram of gain and cost of production, even when it replaced garbage in t ration.

Brewers' dried grains have been used as a nutrient source for gestating sow Harmon *et al.* (1975) fed gestating sows 1.8 kg daily of a maize–soybean me diet containing 0.42% lysine or similar diets in which brewers' dried grai supplied 50 or 100% of the dietary lysine. It was shown that brewers' dried grai could replace all of the soybean meal in the diet without significantly reduci reproductive performance. However, as brewers' grains increased in the die metabolizable energy (3.48, 3.35, and 3.06 kcal/g) and gestation weight gai were reduced. Wahlstrom and Libal (1976) used brewers' dried grains to repla 20 or 40% of a maize–soybean meal diet for pregnant sows. Diets with 0, 20, 40% brewers' dried grains had 12.0, 13.7, or 15.4% crude protein, 0.50% lysi and 3.12, 2.88, and 2.55 Mcal/kg of metabolizable energy (ME). They we hand fed at levels of 1.8, 2.0, and 2.2 kg daily to supply all sows with 5.6 Mc ME daily, except during very cold weather the intakes were raised to 7.0 Mc ME daily in the last month of pregnancy. After farrowing, all sows received maize–sorghum meal diet containing 15% crude protein. Although there was significant effect of diet on litter size, litter weight, or pig weight at birth weaning, sows fed 40% brewers' dried grains gained significantly less than th fed either the control or 20% brewers' dried grains diet, and this reduction w more pronounced during extremely cold weather. Therefore, brewers' dri grains can be used to supply up to 40% of the diet for gestating sows with affecting reproductive performance. It is necessary, however, to increase da sow intake of diets containing high levels of brewers' dried grains to compens for lower metabolizable energy content in order to provide adequate energy f gestation weight gains.