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THE SIMPLIFIED U.S. MODEL (PRELIMINARY VERSION) FOR THE IIASA/FAP GLOBAL SYSTEM OF FOOD AND AGRICULTURE MODELS: DOMESTIC UTILIZATION AND PRICES

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Total utilization of each commodity includes exports, if any, and several components of domestic disappearance. Exports (actually net imports) are determined as a residual of domestic supply over demand in the simultaneous national-international exchange model of IIASA's linkage system consistent with world prices, domestic price, quota and stock policies, and assumed international agreements. Domestic utilization includes seed, losses, feed, nonfood industrial uses, government consumption, stocks and human consumption. Feed demand is discussed elsewhere with the supply side of the model, which is based on the MSU Agriculture model; prices and the other components of demand will be described here.

Commodities and Units

The thirty commodities of supply are aggregated to twenty commodities for utilization purposes, and these are further aggregated to IIASA's ten commodities for the international linkage. Table 1 shows the commodity correspondences and units used in the model.

There remain a few relatively minor inconsistencies between the commodity definitions of this preliminary version of the U.S. simplified model and those of the international system. These will be resolved in the "final"[1] version as the international commodity list for the simplified system is expanded to

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[1]The word "final" is in quotes because no model, if it is to remain useful, can ever have a final version.

Table 1

Commodities and Units of U.S. Simplified Model

International		Domestic Utilization		Domestic Supply	
Commodity[1]	Unit[3]	Commodity[1]	Unit[3]	Commodity[2]	Unit[3]
1. Wheat	th.MT (grain)	1. Wheat	th.MT (grain)	1. Wheat	th.bu
2. Rice	th.MT (polished)	2. Rice	th.MT (polished)	2. Rice	th.cwt. (rough
3. Coarse grain	th.MT (grain)	3. Coarse grain	th.MT (grain)	3. Corn 4. Sorghum 5. Barley 6. Oats	th.bu th.bu th.bu th.bu
4. Beef, sheep	th.MT (carcass)	12. Beef 13. Lamb, mutton	th.MT (carcass) th.MT (carcass)	7. Fed beef 8. Nonfed beef 9. Sheep & lambs	mi.lbs. (live) mi.lbs. (live) th.lbs. (live)
5. Dairy	th.MT (milk)	17. Dairy	th.MT (milk)	10. Milk	mi.lbs.
6. Other animal	th.MT (protein)	14. Pork 15. Poultry 16. Eggs 18. Fish	th.MT (carcass) th.MT (RTC) th.MT (fresh) th.MT (fresh)	11. Pork 12. Turkey 13. Chicken 14. Eggs 15. Fish	mi.lbs. (live) mi.lbs. (RTC) mi.lbs. (RTC) mi.dozen mi.lbs. (fresh)
7. Protein feeds	th.MT (protein)	19. Protein feeds	th.MT (meal)	16. Soybeans 17. Cottonseed 18. Peanuts 19. Flaxseed	th.bu th.tons th.lbs. (farm wt.) th.bu
8. Other foods[4]	mi.$ (1970)	4. Potatoes 5. Vegetables 6. Dry beans 7. Fruits, nuts	th.MT th.MT th.MT th.MT	20. Potatoes 21. Vegetables 22. Dry beans 23. Fruits, nuts 18. Peanuts	th.cwt. th.tons th.cwt. th.tons th.lbs. (farm wt.)
		9. Fats & oils	th.MT (oil)	11. Pork 16. Soybeans 18. Peanuts 19. Flaxseed 24. Cottonseed oil	mi.lbs. (live) th.bu th.lbs. (farm wt.) th.bu mi.lbs. (oil)
		10. Sugar[4]	th.MT (refined)	25. Cane sugar 26. Sugarbeets	th.tons (raw) th.tons (beets)
		11. Coffee,tea,cocoa[4]	th.MT (beans)	none	
9. Nonfood agri-culture	mi.$ (1970)	8. Tobacco 20. Nonagriculture[4]	th.MT (farm wt.) mi.$ (1967)	27. Tobacco 28. Cotton 29. Wool 29. Wool	th.lbs.(farm wt.) th.bales th.lbs. th.lbs.
10. Nonagriculture	mi.$ (1970)	20. Nonagriculture	mi.$ (1967)	30. Nonagriculture	mi.$ (1967)

Notes:

[1]Includes processed products in fresh equivalents.

[2]Additional commodities modeled on the supply side, but not on the demand side, are beef cows (th.head), dairy heifers (th.head), sows (th.head), corn silage (th.tons), and sorghum silage (th.tons).

[3]Unit symbols: th=thousand; mi=million; MT=metric tons; $ =U.S. dollars; RTC =ready to cook; bu = bushels; cwt=hundred weight (100 pounds); lbs=pounds; tons=short tons (200 pounds)

[4]See the text for discussion of inconsistencies in the preliminary version of the U.S.simplified model.

the 19 commodities of the detailed model system in order to conduct analyses using both simplified and detailed models. The current inconsistencies are:

1. alcoholic beverage consumption should be included in the "other foods" category, whereas the model currently includes it in aggregate consumption of the primary ingredients (e.g., wheat, coarse grains, fruit, etc.);
2. use of sweeteners derived from corn should be included with sugar in "other foods" instead of its current accounting in "coarse grains;"
3. "coffee, tea, cocoa" currently includes only coffee;
4. a few miscellaneous items, such as flowers and hides and skins, are not yet accounted for in "nonfood agriculture;" likewise for miscellaneous crops, such as rye; and
5. although cotton and wool are accounted for in the supply of "nonfood agriculture," demand for natural fiber textile products is implicitly included in the nonagriculture aggregate; hence, demand and net imports of the former will be low and of the latter high by the amount of that demand.

Seed and Losses, and Industrial and Government Consumption

Seed rates per acre are assumed for wheat, rice, the four coarse grains, potatoes, dry beans, soybeans (accounted to fats and oils, and protein feeds) and cotton (accounted to protein feeds). Losses due to waste, spoilage, insects, etc., in farm and market storage, processing and distribution activities are modeled as proportions of annual production. In addition, milk fed to calves, as a proportion of milk production, is considered a feed use of milk, and eggs used for hatching is considered a seed use of eggs. The seed and loss rates used are shown in Table 2.

Table 2

Seed and Loss Rates

Commodity	Seed Rate (lbs/acre)	Loss Rate (percent)
1. Wheat	72.0	4
2. Rice (rough)	142.0	9
3. Coarse grains		6
- Corn	13.4	
- Sorghum	6.9	
- Barley	80.6	
- Oats	82.6	
4. Potatoes	1800.0	7
5. Vegetables	----	15
6. Dry beans	52.0	5
7. Fruit	----	15
8. Tobacco	----	6
9. Fats and oils }		0
19. Protein feeds }		0
- Soybeans	63.0	
- Peanuts	5.3*	
- Flax	7.5*	
- Cotton	26.0	
10. Sugar	----	1
11. Coffee	----	0
12. Beef	----	5
13. Lamb	----	5
14. Pork	----	5
15. Poultry	----	5
16. Eggs (hatched)	6.8*	0
17. Milk (for calves)	1.4*	3
18. Fish	----	5
20. Nonagriculture	----	0

*Percent of production.

A general Cobb-Douglas functional form is postulated for the nonfood industrial consumption of each food commodity

$$(1)\quad DEMIND_i(t) = \alpha_i \left(\frac{CPRICE_i(t)}{CPRICE_{20}(t)}\right)^{\beta_i} \left(\frac{DOMSUP_{20}(t)}{1000}\right)^{\sigma_i}$$

where

$DEMIND_i$ = industrial demand for commodity i (th MT)

$CPRICE_i$ = consumer price of commodity i ($/lb)

$CPRICE_{20}$ = nonagricultural consumer price index (1967=1.00)

$DUMSUP_{20}$ = nonagricultural production (mi. 1967 dollars)

$\alpha_i, \beta_i, \sigma_i$ = parameters of the function

A preliminary data search for this version of the model yielded data on nonfood use of only two food commodities: fats and oils, and fish. Zero industrial consumption is assumed for the other food commodities; further research will be necessary to determine if this is a reasonable assumption (e.g., grains, potatoes and sugar for starch, nondrinking alcohol, etc.).

Industrial demand for the nonagricultural commodity, in million 1967 dollars, is interpreted as demand for intermediate inputs and is computed using the same two-sector input-output model used to determine gross nonagricultural production.

$$(2)\quad DEMIND_{20}(t) = AIO_{21} \cdot VA67(t) + AIO_{22} \cdot VN67(t)$$

where

AIO_{21} = dollars of nonagricultural input per dollar of sector 1 output

VA67 = value of agricultural production at 1967 prices

VN67 = value of nonagricultural production at 1967 prices

Total government consumption expenditures (e.g., for the military, institutions, etc.) is assumed to be a fixed proportion (namely, 21 percent) of GNP. This total is modified in order to achieve the exogenously specified national trade balance (necessary for consistency within the global system), if that balance cannot otherwise be achieved at equilibrium prices given quota constraints and tax rate constraints.

This total public expenditure is then allocated to the individual commodities by first assuming a proportion goes to the nonagricultural commodity, and then distributing the rest to the food commodities in the same proportion as lagged private consumption expenditures. The data for food consumption used to calibrate the human food consumption functions described below appears to have been derived as a residual in food balance sheet calculation, with no distinction between public and private consumers. Therefore, until this question can be resolved or other data can be found which explicitly identifies government consumption of food commodities, all government consumption is assumed to be of the nonagricultural commodity.

Carry-Out Stock Demand

Stocks are considered in the model for wheat, coarse grains, milk, soybeans and peanuts. The oil and cake equivalents of soybean and peanut stocks are allocated to fats and oils and protein feeds, respectively. Milk stocks include the fresh milk equivalents of milk products stocks. Coarse grain stocks are modeled as an aggregate of corn, sorghum, barley and oat stocks.

The modeling of wheat and coarse grains stocks is more complicated than that of the other commodities because stocks of these commodities are closely related to price control policies. Specifically, the government will act as a buyer (or stockpiler) of last resort, if necessary, in order to maintain a minimum farm price (or "loan rate"). At the other end, if farm price is rising above an upper target (the "call price"), the government will call in loans, essentially requiring farmers to sell the stocks they hold as part of government programs. It should be mentioned here that this version of the model does not distinguish different types of stocks, such as on-farm stocks, government buffer stocks, market stocks, etc. Rather, total national carry-out stocks are modeled in the aggregate.

Since wheat and coarse grains stocks are modeled identically, the following discussion applies to both commodities. The basic hypothesis is that stocks build up as prices fall and are depleted as prices rise. A negative exponential function is assumed to represent this behavior over most of the relevant price range (curve III in Figure 1). For the function to be homogenous of degree zero, the independent variable is the price P of the commodity relative to nonagricultural prices P_n. At the call price PC, stocks are assumed to have fallen to a minimum, pipeline level XL below which they will not go even if the relative price is higher than PC (curve IV in Figure 1).

Since the government is assumed to be the stockpiler of last resort, the price will not fall below the loan rate PL. (Given the U.S. role in the world market for wheat and coarse grains, this implies supporting the world price as well.) This would imply a vertical, perfectly elastic segment of the stock demand curve at PL. In order for stocks to be a function of price, however, as required by the overall model, a steep negative exponential segment (curve II in Figure 1) is modeled within a narrow band around PL. Thus, PL+ and PL- are currently assumed to be one percent above and below the loan rate, respectively.

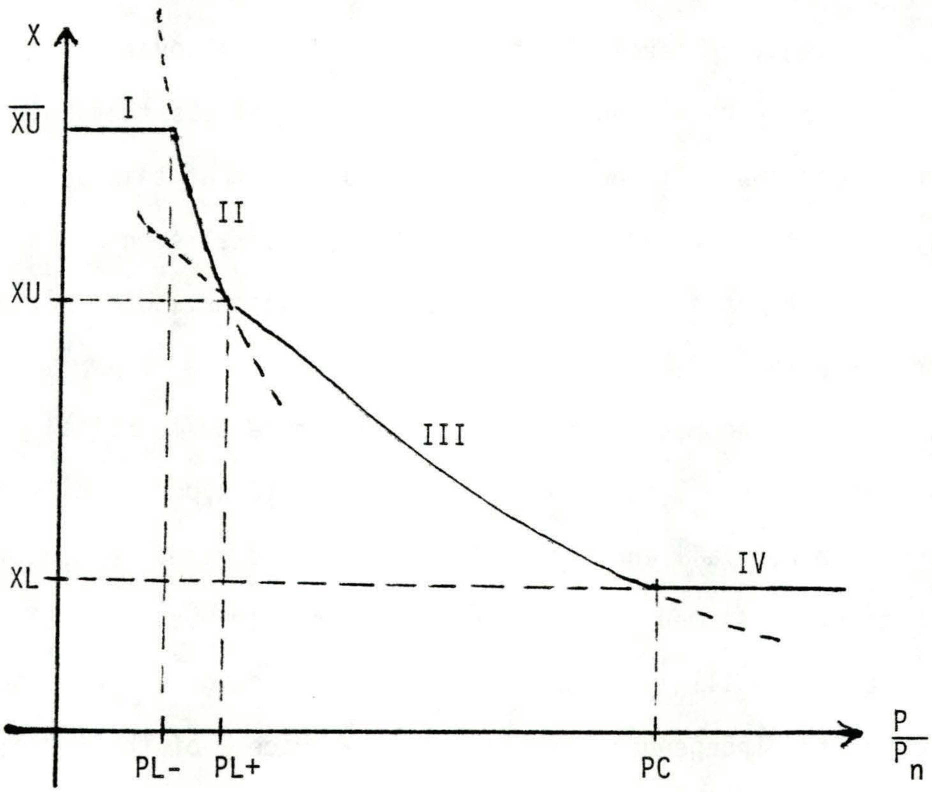

Figure 1

Carry-Out Stocks Function:
Wheat and Coarse Grains

At PL+, stocks are assumed to be at their "normal" maximum XU and at PL- their "logical" maximum $\overline{XU}$. The logical maximum $\overline{XU}$, assuming there will be no imports of these commodities, is defined as total supply Y (production plus carry-in stocks) less a specified minimum level of domestic utilization. Since stocks cannot logically increase above this level, the demand curve (I in Figure 1) is perfectly inelastic at prices below PL-. However, this represents an unrealistically high level of stocks, so that the loan rate should be successfully supported before reaching this level. At PL+, the normal maximum XU is defined to be

(3) $XU(t) = \frac{\lambda}{1+\lambda} Y(t)$

where

Y = total supply (th MT)

λ = maximum stock as a proportion of non-stock disappearance

The parameter λ is currently assumed to be 70 percent for wheat and 60 percent for coarse grains. Similarly, at and above the call price PC, pipeline stocks XL are defined to be

(4) $XL(t) = \frac{\mu}{1+\mu} Y(t)$

where μ is again a proportion of non-stock disappearance (currently assumed to be 15 percent for wheat and 10 percent for coarse grains).

The negative exponential curves II and III both have the form, for stock level X,

(5) $X(t) = \alpha\, e^{-\beta(P(t)/P_n(t))}$

Two points on each of these curves are assumed to be known: (PL-, $\overline{XU}$) and (PL+, XU) for curve II, and (PL+, XU) and (PC, XL) for curve III. Therefore, the parameters α and β can be determined as

(6) $\alpha = \overline{XU}(t)e^{\beta PL-}$ and $\beta = \dfrac{\ln(\overline{XU}(t)/XU(t))}{(PL+) - (PL-)}$

for curve II, and

(7) $\alpha = XU(t)e^{\beta PL+}$ and $\beta = \dfrac{\ln(XU(t)/XL(t))}{PC(t) - (PL+)}$

for curve III. Thus, the curves are completely specified by the parameters λ and μ, and by the price policies PC and PL. It is interesting to note that, with α and β defined as in (6) and (7), the stock demand functions reduce to the Cobb-Douglas form, for example for curve III,

(8) $X = (XU)^{\left[\frac{PC-(P/P_n)}{PC - (PL+)}\right]} (XL)^{\left[\frac{(P/P_n)-(PL+)}{PC - (PL+)}\right]}$

whose exponents add to unity.

For this version of the model, peanut stocks are projected exogenously, while milk and soybean stocks are modeled with the following econometrically estimated equations. The soybean stock equation will be replaced when the model is updated to incorporate the new soybean component of the MSU Agriculture Model (part of which serves as the supply side of the present model).

(9) $MLKSTK(t) = A_0 + A_1 \cdot MKSUPP(t) + A_2 \cdot DOMSUP_{17}(t) + A_3\ GNPPC(t)$

(10) $SBSTK(t) = B_0\ (QSUPSB(t))^{B_1}$

where

MLKSTK	= milk stocks (th MT)
SBSTK	= soybean stocks (th MT)
MKSUPP	= milk support price ($/kg)
$DOMSUP_{17}$	= milk supply (production plus carry-in stocks) (th MT)
GNPPC	= per capita GNP (th $/person)
QSUPSB	= soybean supply (production plus carry-in stocks) (mi MT).

Human Consumption

A rather complicated, nonlinear function is used to model the per capita consumption of each food commodity (in pounds per person per year) in order to exhibit a hypothesized mode of consumption behavior with respect to income, prices and time. Specifically, per capita consumption PCC is the product of three functions representing an income factor, a price factor and a time factor, respectively. For each food commodity i,

$$(11) \quad PCC_i(t) = f_i(M(t), P(t)) \cdot g_i(P(t)) \cdot h_i(t)$$

where M is current nominal per capita disposable income (\$/person-year), P is a vector of nominal consumer prices (\$/pound), and t is time, and where

$$(12) \quad f_i(M,P) = a_i + (b_i - a_i)e^{-c_i (M/CPI)^2}$$

$$(13) \quad g_i(P) = \prod_j [1 - x_{ij}\, d_j\, (1 - e^{-\sigma_j (P_j/CPI)})]$$

$$(14) \quad h_i(t) = \alpha_i + (\beta_i - \alpha_i)\, e^{-\delta_i (t - t_{0i})^2}$$

and where the consumer price index CPI is

$$(15) \quad CPI(t) = \sum_i \omega_i \frac{P_i(t)}{P_i(1967)}$$

As shown in Figures 2 and 3,[2] the income factor f and its parameters a and b have units of per capita consumption and are the major determinants of PCC, while g and h serve as multipliers. The price factor g is nominally unity when all prices are zero, and the time factor h is unity (with $\alpha = \beta = 1$) for commodities with no time trend assumed.

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[2] A figure is not given for the time factor h; it would look exactly the same as Figure 2, with α and β in place of a and b, and $(t-t_0)$ in place of (M/CPI).

Indeed, there are only four commodities (wheat, coarse grains, tobacco and milk) for which time trends are assumed to reflect changes in per capita consumption not reasonably attributable to price, income or other endogenous model variables. For example, a sharp decline in tobacco consumption per capita has been observed, beginning in about 1964 when the first Surgeon-General's report was issued on the health hazards of cigarette smoking. Zero food consumption of "protein feeds" is assumed ($a_{19} = b_{19} = 0$), although this restriction may have to be relaxed if food use of soybeans can be projected to become significant in the U.S.

The asymptotic behavior of f_i has advantages over a constant income elasticity model, particularly in long-run analysis as real income increases, in that consumption will remain within reasonable physical and nutritional ranges. Indeed, the set of values for the a_is may be specified according to what could be considered to be a realistic or plausible dietary and nutritional mix in the limit "as real income goes to infinity." Note in Figure 2 that setting $b_i > a_i$ implies an inferior good, while $b_i < a_i$ indicates a normal good.

Cross-price effects in the price factor g_i, i.e., the impacts of the price of commodity j on consumption of commodity i, are reflected in the matrix $[x_{ij}]$. For the own-price effect, i=j, $x_{ij}=1.0$, for complementary goods $x_{ij} > 0$, and for substitute commodities $x_{ij} < 0$. $x_{ij} = 0$ implies no cross-price effect. From this point of view, a commodity is a perfect complement to itself, i.e., one always eats rice with rice.

Note in equation (13) and Figure 3 that x_{ij} is a proportion of d_j. That is, the effect of commodity j's price on consumption of commodity i is proportional to its effect on own consumption, i.e., the consumption of

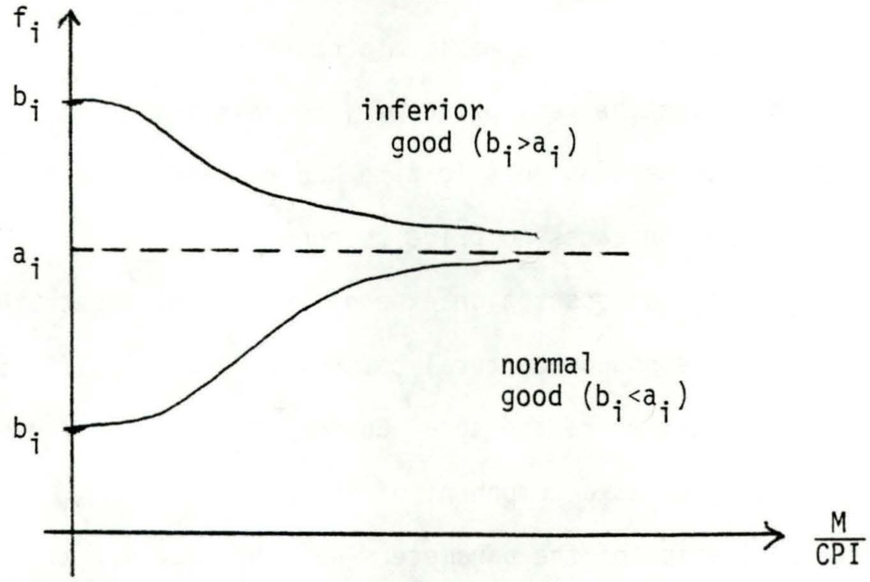


Figure 2

The Income Factor of
Per Capita Consumption

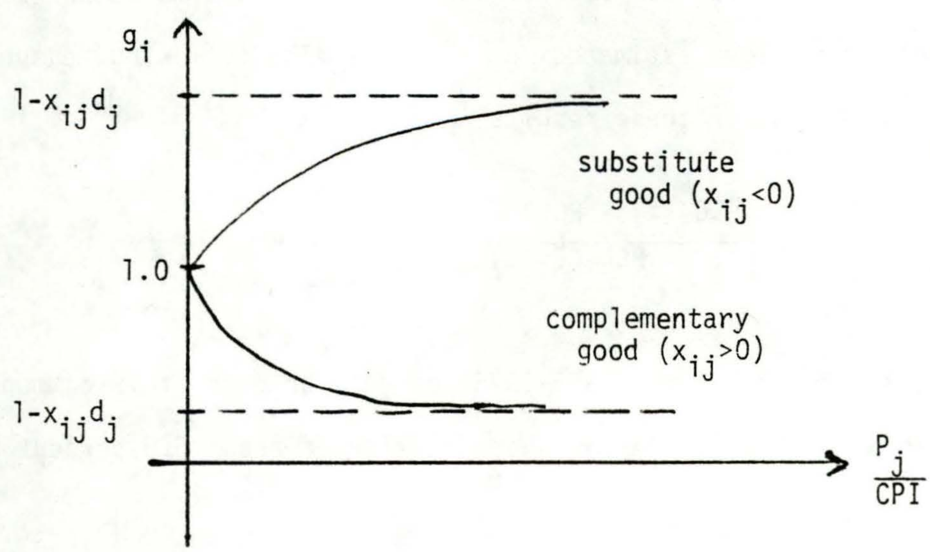


Figure 3

The Price Factor of
Per Capita Consumption

commodity j. The d_j represents the maximum proportional deviation of commodity j consumption as the real price of j increases without limit. Thus, $d_j = 1$ implies consumption goes to zero "as real price goes to infinity," while $d_j = 0$ indicates no price response.

In order to maintain a consumption expenditure budget constraint, per capita consumption of the nonagricultural commodity PCC_{20} (in 1967 $/person) is computed as a residual, where the total budget is taken to be disposable income M, implying savings as a component of PCC_{20}.

Econometric estimation of the parameters--a_i, b_i, c_i, d_i, x_{ij}, α_i, β_i, σ_i, δ_i for i and j = 1, 2, . . ., 18--has not been attempted. Preliminary judgemental estimates were made and then further refined in "manually tuning" the model to track PCC for the 1970-1976 period using actual historical values for M and P over that period. Although elasticities as such are not used in the model, as a check on model performance with these parameter values, Table 3 shows elasticities computed from the partial derivatives of PCC in equation (11) with respect to prices and income. In addition, the Appendix includes plots comparing historical observations PCCACT with simulation results PCC using the parameter values estimated in this way. The following measure of overall goodness of fit for these results

$$(16) \quad \sum_{t=1955}^{1976} \sum_{\substack{i=1 \\ i\neq 19}}^{20} \left| \frac{PCC_i(t) - PCCACT_i(t)}{PCCACT_i(t)} \right|$$

has a value of 22.3. For 22 years (1955-1976) of data on each of 19 commodities, i.e., 418 observations, this implies an average error of about 5.3 percent per observation.

Table 3

Price and Income Elasticities of Demand in 1970

Price / Quant.	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	P_{11}
	Price Elasticities										
	-.047	.013	.002	.013	.009	.007	.005	-.002	-.001	-.002	-.001
	.005	-.077	.003	.024	.044	.019	-.012	-.013	-.004	-.014	-.004
	-.007	.004	-.019	-.003	-.017	-.001	-.015	-.017	-.005	-.019	-.005
	.011	.025	-.000	-.179	.051	.020	-.005	-.006	-.002	-.007	-.002
	-.001	-.000	-.000	.014	-.301	.017	.045	-.001	-.000	-.001	-.000
	.017	.018	.000	.035	.046	-.076	.006	.007	.002	.008	.002
	-.002	-.000	-.000	-.000	.019	-.000	-.232	-.002	-.001	-.002	.009
	.000	.000	.000	.000	.000	.000	.000	-.037	.000	.000	.000
	-.019	-.004	-.001	-.004	-.031	-.001	-.018	-.020	-.041	-.022	-.006
	-.002	-.000	-.000	-.000	-.002	-.000	.012	-.002	-.001	-.111	.004
	.012	.002	.001	.003	.013	.001	.012	.013	.004	.014	-.001
	-.011	-.002	-.001	-.002	-.012	-.001	-.011	-.012	-.004	-.013	-.004
	.025	.005	.002	.005	.027	.001	.024	.027	.009	.030	.008
	-.001	-.000	-.000	-.000	-.001	-.000	-.001	-.001	-.000	-.001	-.000
	-.018	-.004	-.001	-.004	-.020	-.001	-.018	-.020	-.006	-.022	-.006
	.015	.003	.001	.003	.016	.001	.014	.016	.005	.017	.005
	.003	.001	.000	.001	.003	.000	.003	.003	.001	.004	.001
	-.014	-.003	-.001	-.003	-.015	-.001	-.013	-.015	-.005	-.016	-.004
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	-.004	-.001	-.010	-.003	-.006	-.001	-.004	-.018	-.004	-.003	-.004

Price / Quant.	P_{12}	P_{13}	P_{14}	P_{15}	P_{16}	P_{17}	P_{18}	P_{19}	P_{20}	Income Elas.	Σ*
	-.003	-.002	-.002	-.001	.024	-.003	-.001	0.000	-.067	.057	-.00
	-.020	-.015	-.011	-.006	-.006	-.025	-.004	0.000	-.493	.608	-.00
	-.026	-.019	-.015	-.008	-.008	-.032	-.005	0.000	-.635	.850	-.00
	-.009	-.007	-.005	-.003	-.003	-.012	-.002	0.000	-.229	.362	-.00
	-.001	-.001	-.001	-.000	-.000	-.002	-.000	0.000	-.030	.265	-.00
	.011	.008	.006	.003	.003	.013	.002	0.000	.264	-.375	.00
	-.003	-.002	-.002	-.001	-.001	.002	-.001	0.000	-.067	.283	-.00
	.000	.000	.000	.000	.000	.001	.000	0.000	.011	.023	.00
	-.031	-.023	-.018	-.010	-.009	-.039	-.006	0.000	-.766	1.067	-.00
	-.003	-.002	-.002	-.001	-.001	-.002	-.001	0.000	-.071	.184	-.00
	.020	.015	.011	.006	.006	.032	.004	0.000	.495	-.573	.00
	-.601	.045	.126	.057	.011	-.023	.070	0.000	-.457	.843	-.00
	.070	-.105	.038	.030	.013	.052	.018	0.000	1.025	-1.299	.00
	.076	.020	-.549	.048	.005	-.001	.055	0.000	-.023	.371	-.00
	.057	-.007	.048	-.241	-.009	-.038	.024	0.000	-.744	1.026	-.00
	.024	.018	.014	.008	-.122	.030	.005	0.000	.594	-.664	.00
	.005	.004	.003	.002	.010	-.194	.001	0.000	.123	.028	.00
	.031	-.011	.015	.010	-.007	-.028	-.294	0.000	-.552	.922	-.00
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
	-.017	-.003	-.013	-.008	-.006	-.017	-.007	0.000	-.972	1.100	.00

*Σ = the sum of income and all cross-price elasticities; must equal zero for homogeneity.

Prices

Prices are the major feedback from the simultaneous national-international exchange system to the national model. Domestic consumer prices are determined based on world prices and national price policies. A "target" (or "desired" or "normal") price for each commodity PD_i is defined to be proportional to the retail-level world price PWD_i.

(17) $PD_i = DPD_i \cdot PWD_i$

where DPD can be interpreted to embody not only tariff policies, for instance, but also quality and other differences between the domestic commodity and the world commodity, transportation costs, etc. The retail-level world price PWD_i is defined as the world price PW_i plus a domestic marketing/processing margin PRM_i representing a quantity of the nonagricultural good (commodity n) times the price of that good. PRM_i is also used as the margin between domestic farm and consumer prices.

(18) $PWD_i = PW_i + PRM_i \cdot PW_n$

The price PD_i will be the equilibrium price P_i unless a specified minimum QEX_i or maximum QIM_i demand constraint is effective, where these can be interpreted as export and import quotas, respectively. If one of these constraints is effective, the equilibrium price P_i will be below or above PD_i, respectively--unless buffer stock behavior is modeled. In that case (as for wheat, coarse grains, milk and protein feeds discussed above), equilibrium carry-out stocks will deviate above or below a target level, respectively, where the target stocks are those determined in equations (5), (9) and (10) above. Maximum and minimum stocks are also specified, and if the stock adjustment is such as to make a stock constraint effective, <u>then</u> P_i will deviate from PD_i.

These prices are at the 10-commodity international aggregation and must be disaggregated to the U.S. model's 20-commodity utilization level for consumer prices and the 30-commodity supply level for farm prices (see Table 1). The 10-commodity aggregate prices P_i are related to the 20-commodity consumer prices CP_k by

$$(19)\quad P_i = \left[\sum_k \omega_k \frac{CP_k}{\sigma_k}\right] \Big/ \sum_k \omega_k$$

for i = 1, 2, . . ., 10 and where the summation is over commodities k belonging to aggregate i. In (19), ω_k is the consumer price index weight of equation (15), and σ_k is a unit conversion factor, e.g., th.MT of carcass weight to the th.MT of protein equivalent (see Table 1).

For commodities with a one-to-one correspondence, i.e., wheat, rice, coarse grains, milk and nonagriculture, the consumer prices are simply

$$(20)\quad CP_k = \sigma_k P_i$$

For the other commodities, the CP_k are determined from econometrically estimated equations, generally as functions of per capita income, per capita supply, and other prices. Each CP_k in a group i is then ratioed, given P_i, so (19) holds.

Producer prices PP_k at the 20-commodity level are determined from consumer prices and an assumed farmer share α_k

$$(21)\quad PP_k = \delta_k \alpha_k CP_k$$

where δ_k is a unit conversion, e.g., from \$/pound for consumer prices to \$/bushel for farm prices. The marketing/processing margins PRM_i used in (18) are computed from the farmer shares α_k by

$$(22)\quad PRM_i = \left\{\left[\sum_k \omega_k (1-\alpha_k) \frac{CP_k}{\sigma_k}\right] \Big/ \sum_k \omega_k\right\} \Big/ P_n$$

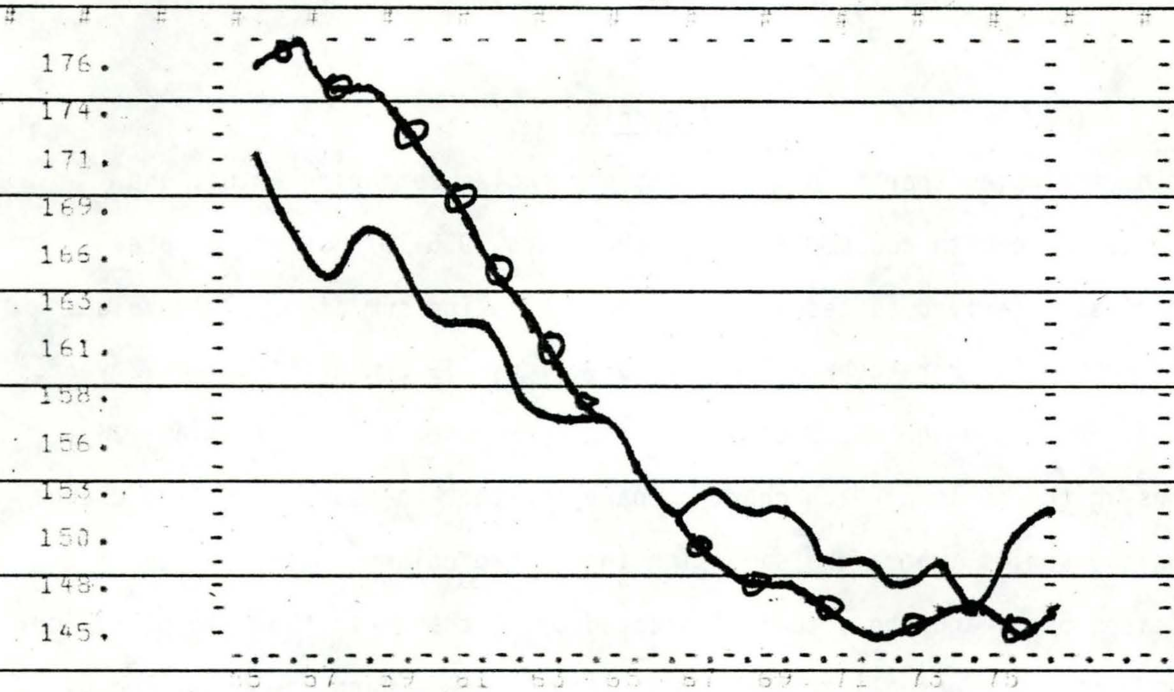
where, again, the summation is over commodities k in group i.

The 20-commodity producer prices are then disaggregated to the 30-commodity level. For example, it is assumed that PP_3 for coarse grains represents the corn price. The farm prices of barley, oats and sorghum are then related to that of corn by equations of the type

(23) $PPCG_j = \lambda_j \, PP_3^{\mu_j}$

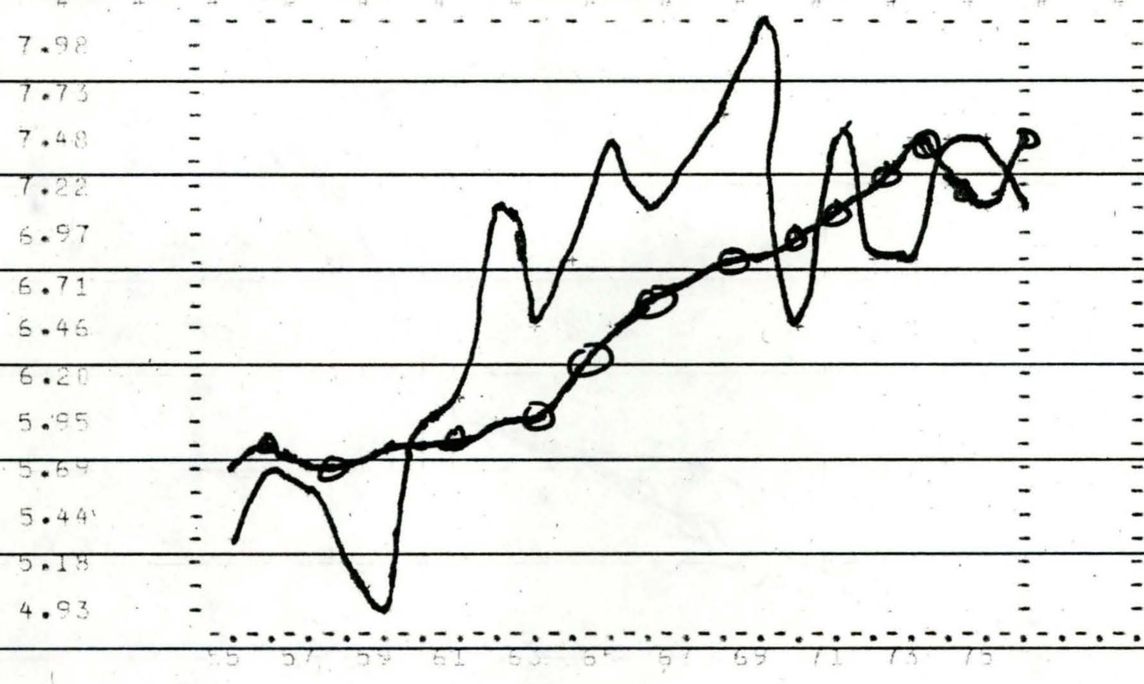
Appendix

The following charts include plots and tables comparing actual and estimated per capita consumption over the years 1955-1976 using the preliminary data derived as described in the text. The sum of absolute values of proportional errors over all 418 observations (19 commodities and 22 years) is 22.3, or an average of about 5.3 percent per observation. The last two columns in the table of each chart compare the year-to-year percentage change in the two series, where the same sign in the two columns means the estimated (indicated by *) and the actual (indicated by +) change in the same direction. In the plots, the actual series is indicated by ——— and the estimated by —θ—.



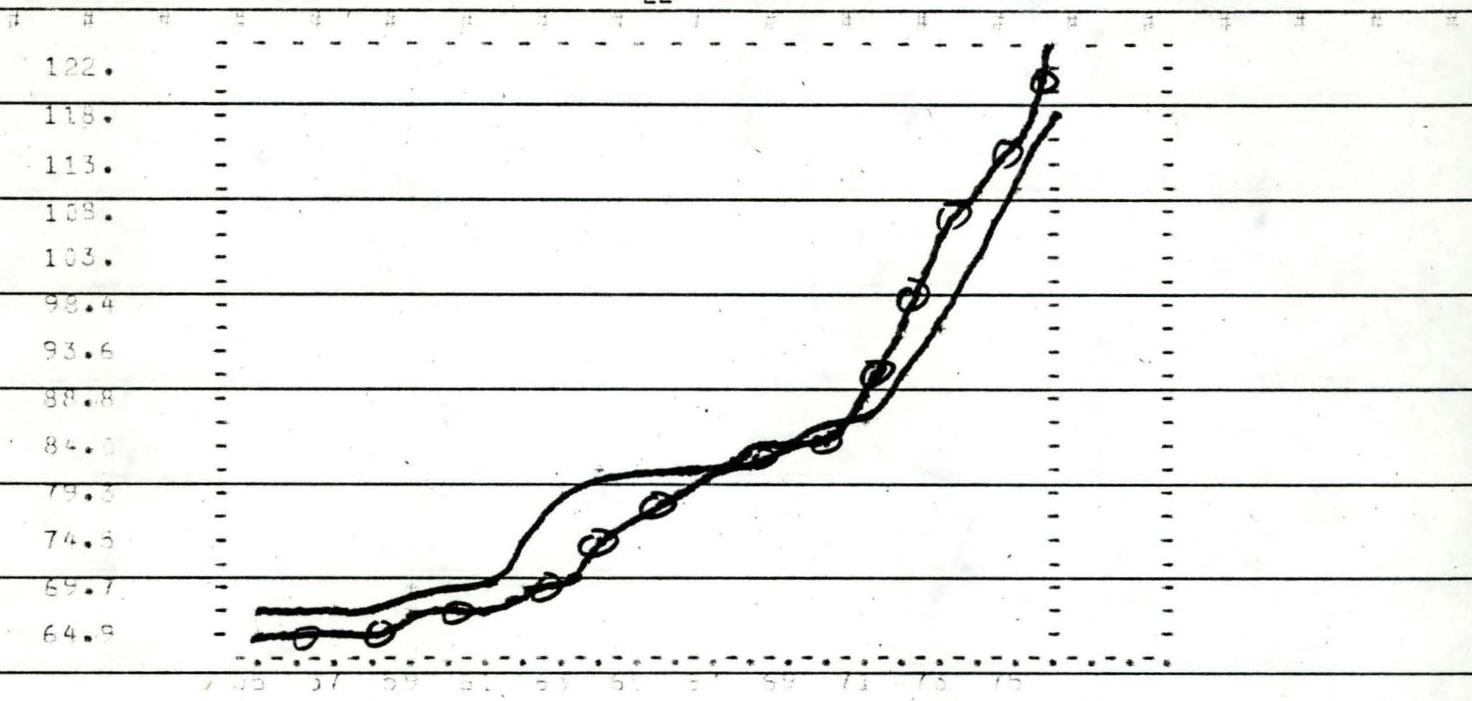
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 1-WHEAT

YEAR	LEVELS (+)	(*)	CHANGE (+)	(*)
1955	172.046	177.064	0.000	0.000
1956	167.633	177.741	-2.565	.382
1957	[illegible]	175.272	-1.332	-.826
1958	167.506	175.550	1.273	-.410
1959	165.165	172.972	-1.398	-1.469
1960	162.944	170.590	-1.314	-1.377
1961	[illegible]	[illegible]	[illegible]	[illegible]
1962	158.494	163.430	-2.543	-2.106
1963	156.857	160.325	-1.033	-1.900
1964	157.181	157.701	.287	-1.637
1965	[illegible]	[illegible]	[illegible]	[illegible]
1966	153.756	152.755	-1.759	-1.605
1967	153.477	149.716	.472	-1.989
1968	152.841	148.814	-.414	-.603
1969	[illegible]	[illegible]	[illegible]	[illegible]
1970	149.754	147.133	-1.643	-.652
1971	149.007	146.087	-.499	-.711
1972	148.815	146.184	-.129	.067
1973	[illegible]	147.475	[illegible]	.883
1974	146.651	146.536	-2.030	-.636
1975	150.386	145.079	'2.546	-.995
1976	152.256	146.409	1.250	.916



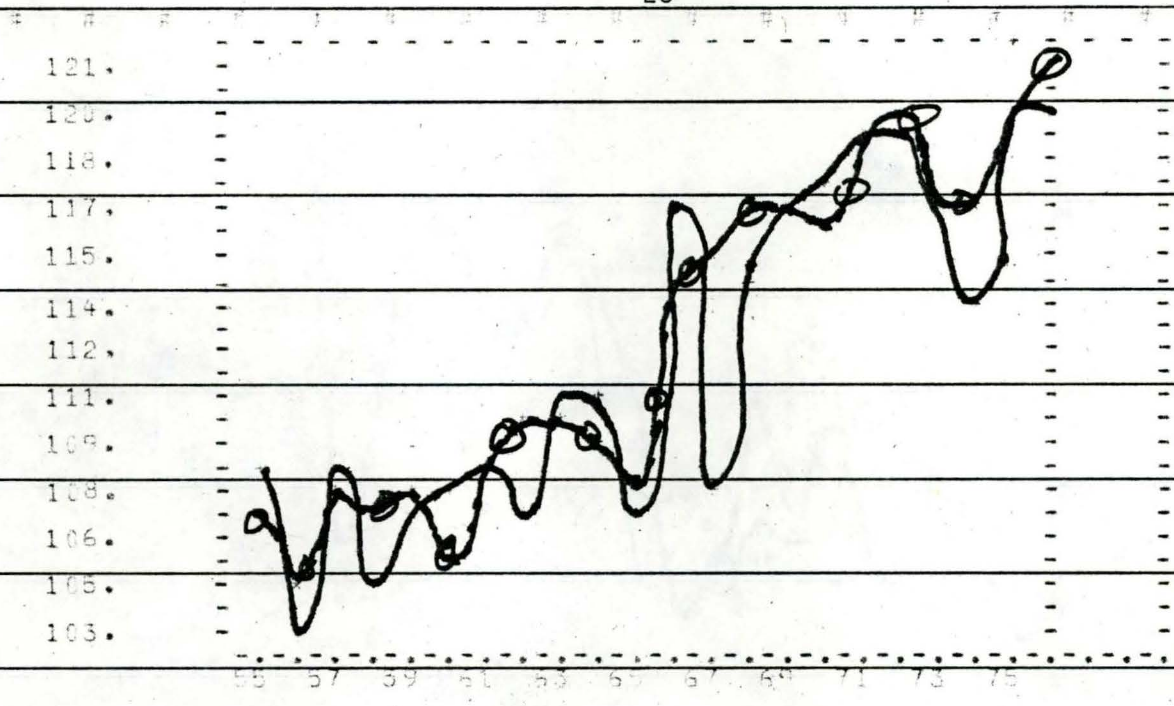
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 2-FICE

YEAR	LEVELS (+)	(*)	CHANGE (+)	(*)
1955	5.346	5.692	0.000	0.000
1956	5.731	5.839	7.201	2.574
1957	5.631	5.790	-1.752	-.833
1958	5.249	5.768	-6.778	-.381
1959	4.928	5.846	-6.120	1.343
1960	6.000	5.868	21.755	.375
1961	6.120	5.874	2.012	.104
1962	7.209	5.977	17.789	1.750
1963	6.469	6.038	-10.262	1.026
1964	6.902	6.322	6.689	4.697
1965	7.483	6.577	8.431	4.046
1966	7.194	6.694	-3.895	1.775
1967	7.366	6.778	2.393	1.259
1968	7.692	6.888	4.425	1.614
1969	8.112	6.932	5.465	.636
1970	6.558	7.020	-19.162	1.270
1971	7.552	7.132	15.160	1.603
1972	6.956	7.314	-7.890	2.552
1973	6.904	7.558	-.736	3.339
1974	7.617	7.283	8.884	-3.640
1975	7.557	7.173	.531	-1.518
1976	7.124	7.482	-5.723	4.314



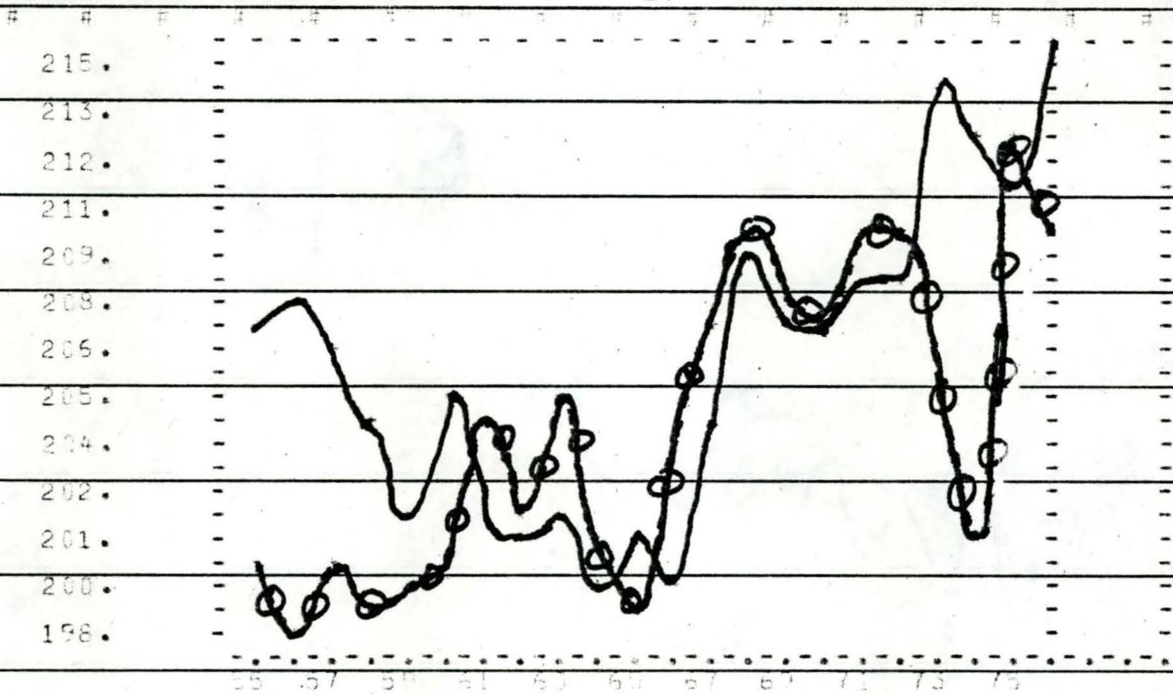
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 3-COARSE GRN

YEAR	LEVELS (+)	LEVELS (*)	CHANGE (+)	CHANGE (*)
1955	68.359	64.887	0.000	0.000
1956	68.850	66.502	.719	2.489
1957	67.766	66.498	-1.576	-.005
1958	69.389	65.848	2.393	-.977
1959	71.255	67.446	2.691	2.426
1960	71.725	67.472	.660	.039
1961	71.819	68.274	.132	1.188
1962	74.544	69.892	3.794	2.370
1963	79.838	70.988	7.101	1.569
1964	81.864	74.599	2.538	5.087
1965	82.913	77.710	1.281	4.171
1966	82.716	80.316	-.238	3.353
1967	84.022	82.350	1.580	2.533
1968	86.091	83.961	2.462	1.956
1969	85.351	84.434	.302	.563
1970	87.343	85.669	1.148	1.463
1971	87.871	89.557	.605	4.538
1972	91.662	97.063	4.314	8.381
1973	98.400	107.455	7.351	10.707
1974	103.983	110.888	5.673	3.194
1975	111.135	116.928	6.878	5.448
1976	118.329	124.754	6.473	6.693



ACTUAL (+) AND ESTIMATED (*) VALUES FOR 4-POTATOES

YEAR	LEVELS (+)	LEVELS (*)	CHANGE (+)	CHANGE (*)
1955	109.000	106.809	0.000	0.000
1956	103.000	104.653	-5.505	-2.018
1957	109.000	108.121	5.825	3.313
1958	105.000	107.073	-3.670	-.969
1959	107.000	107.884	1.905	.758
1960	108.000	105.625	.935	-2.094
1961	109.000	108.631	.926	2.817
1962	107.000	110.268	-1.835	1.535
1963	111.000	110.577	3.738	.280
1964	111.000	109.609	0.000	-.875
1965	107.000	107.789	-3.604	-1.651
1966	117.000	114.472	9.346	6.200
1967	108.000	115.606	-7.692	.991
1968	115.000	116.902	6.481	1.121
1969	117.000	116.743	1.739	-.136
1970	118.000	116.433	.855	-.266
1971	119.000	119.273	.847	2.440
1972	119.000	120.135	0.000	.722
1973	117.000	117.004	-1.681	-2.606
1974	114.000	117.000	-2.564	-.004
1975	122.000	120.359	7.018	2.871
1976	120.000	121.498	-1.639	.946

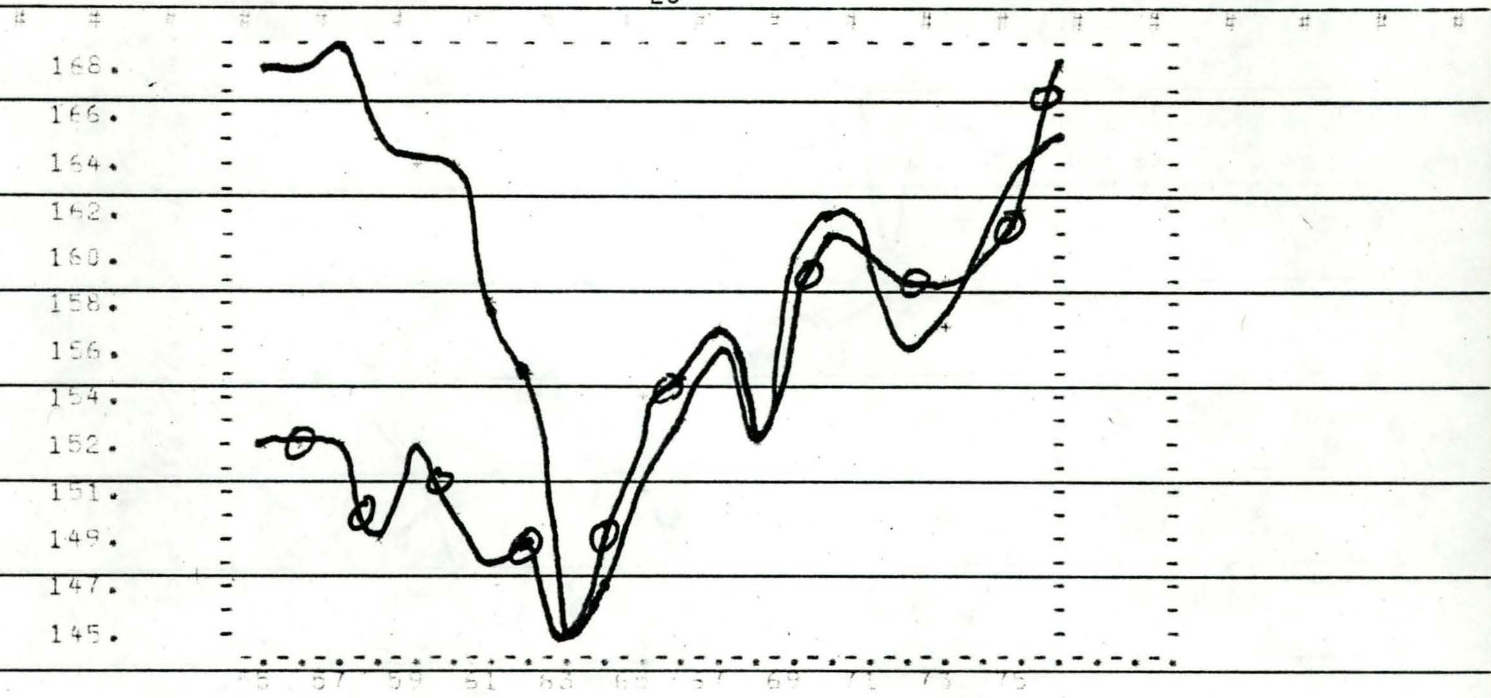


ACTUAL (+) AND ESTIMATED (*) VALUES FOR S-VEGTAB

YEAR	LEVELS (+)	(*)	CHANGE (+)	(*)
1955	207.610	200.924	0.000	0.000
1956	207.970	198.243	.173	-1.334
1957	206.910	200.709	-.510	1.244
1958	204.410	199.431	-1.208	-.637
1959	202.140	199.929	-1.111	.250
1960	205.440	200.889	1.633	.480
1961	202.240	204.578	-1.558	1.836
1962	201.460	202.334	-.386	-1.097
1963	202.130	205.267	.333	1.449
1964	199.740	201.594	-1.182	-1.790
1965	201.190	199.581	.725	-1.0[illegible]
1966	200.110	203.957	-.537	2.233
1967	204.600	207.761	2.244	1.865
1968	209.710	210.401	2.498	1.271
1969	207.27[illegible]	208.099	-1.164	-1.094
1970	207.770	207.459	.241	-.308
1971	208.790	210.033	.491	1.241
1972	209.010	210.052	.105	.009
1973	213.[illegible]90	205.259	2.383	-2.282
1974	213.140	201.552	-.397	-1.806
1975	211.410	213.062	-.812	5.711
1976	215.310	209.865	1.845	-1.580

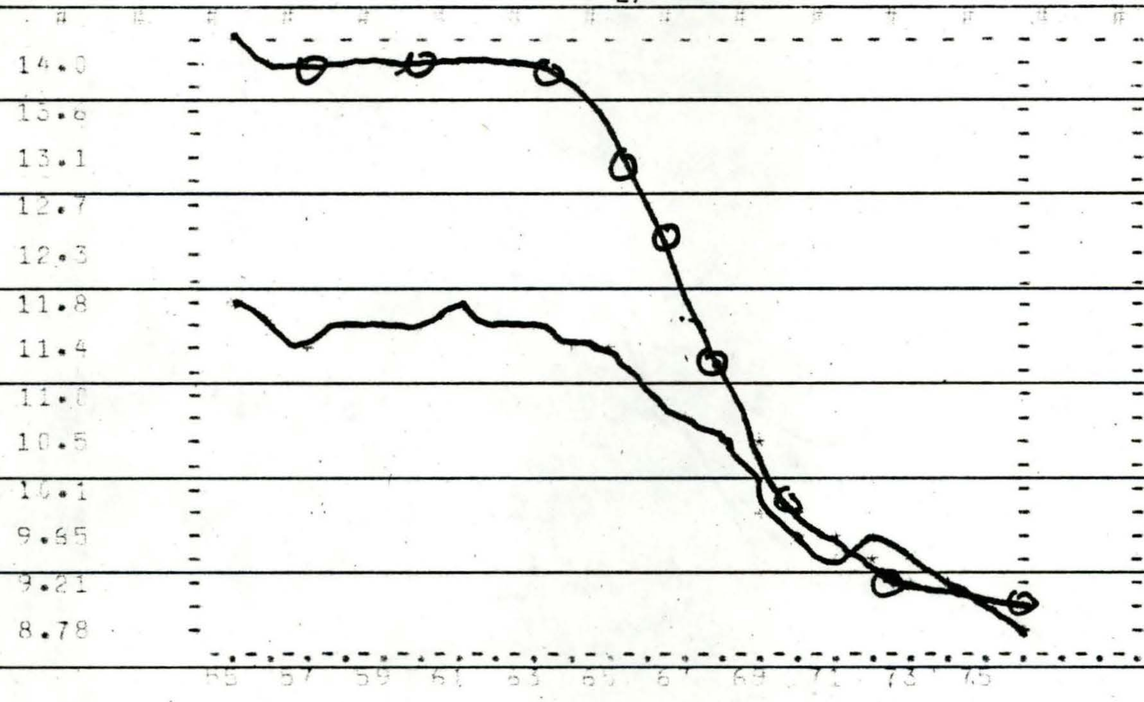
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 6-BEANS

YEAR	LEVELS (+)	(*)	CHANGE (+)	(*)
1955	7.500	7.094	0.000	0.000
1956	8.000	7.166	6.667	1.023
1957	7.600	7.123	-5.000	-.604
1958	7.700	7.125	1.316	.025
1959	7.700	7.102	0.000	-.315
1960	7.300	7.154	-5.195	.729
1961	7.900	7.075	8.219	-1.101
1962	7.600	7.035	-3.797	-.565
1963	7.600	6.992	0.000	-.607
1964	7.600	6.957	0.000	-.508
1965	6.600	6.898	-13.158	-.843
1966	6.300	6.685	-4.545	-3.089
1967	6.900	6.648	9.524	-.561
1968	6.400	6.563	-7.246	-1.280
1969	6.900	6.570	7.812	.108
1970	5.900	6.569	-14.493	-.006
1971	5.900	6.432	0.000	-2.093
1972	6.400	6.331	8.475	-1.574
1973	6.500	6.280	1.562	-.804
1974	6.700	6.143	3.077	-2.175
1975	6.200	6.269	-7.463	2.044
1976	6.100	6.108	-1.613	-2.560



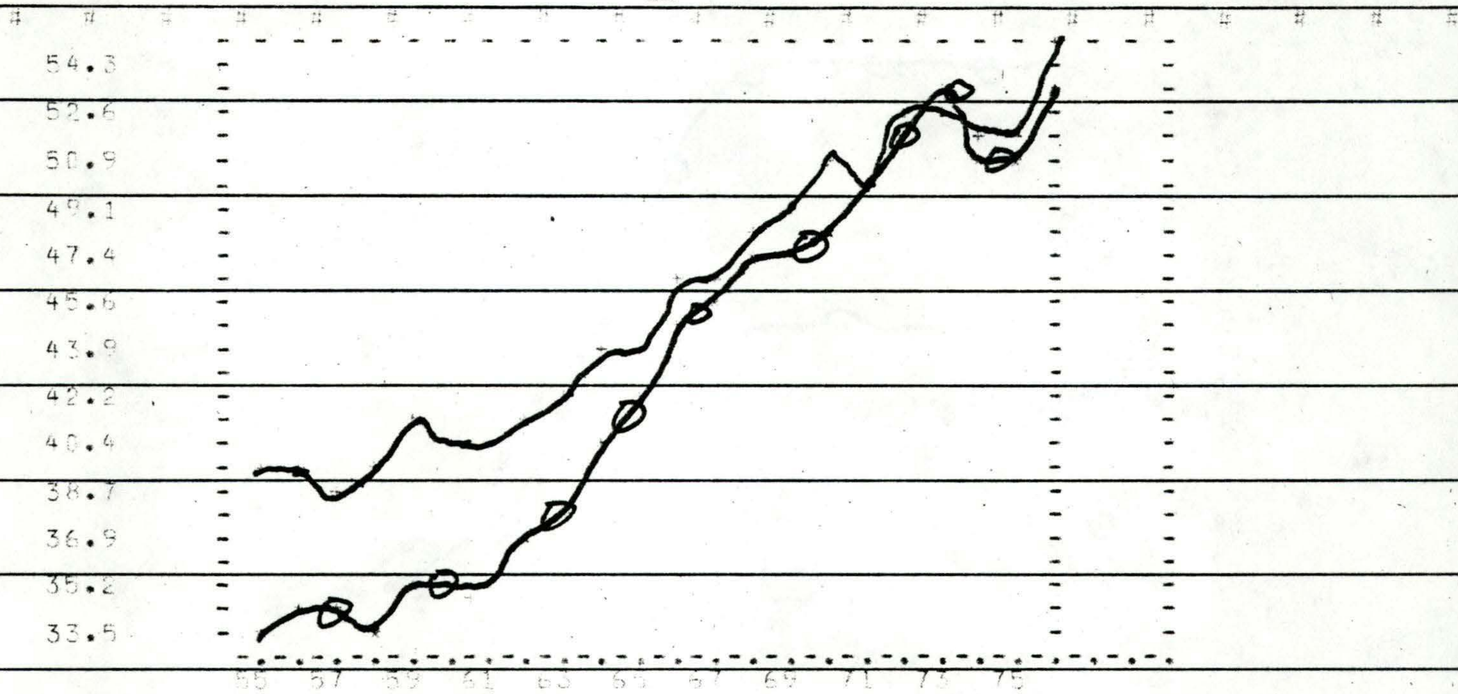
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 7-FRUIT

YEAR	LEVELS (+)	LEVELS (*)	CHANGE (+)	CHANGE (*)
1955	168.450	153.116	0.000	0.000
1956	168.900	153.392	.267	.181
1957	169.1[illegible]	152.715	.118	-.441
1958	165.200	148.984	-2.306	-2.443
1959	164.700	152.544	-.303	2.389
1960	165.0[illegible]	149.897	.213	-1.735
1961	15[illegible]	148.395	-3.484	-1.002
1962	155.700	149.042	-2.260	.435
1963	144.650	145.301	-7.097	-2.510
1964	146.650	149.432	1.383	2.844
1965	151.450	15[illegible]	3.273	3.746
1966	153.700	155.736	1.486	.456
1967	157.100	158.213	2.212	1.590
1968	152.750	152.964	-2.769	-3.318
1969	160.650	158.659	5.172	3.723
1970	162.900	162.134	1.401	2.190
1971	161.250	161.062	-1.013	-.662
1972	156.400	159.721	-3.008	-.832
1973	158.250	159.695	1.183	-.016
1974	161.200	160.508	1.864	.509
1975	164.800	162.727	2.233	1.383
1976	165.300	168.218	.303	3.374



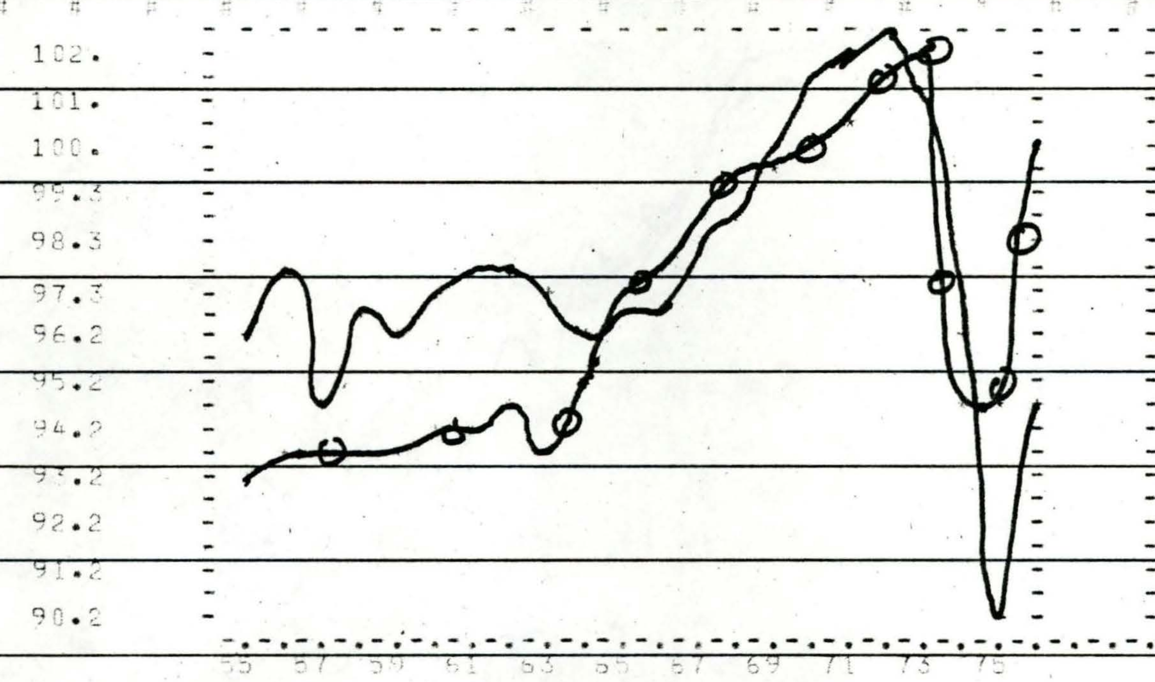
ACTUAL (+) AND ESTIMATED (*) VALUES FOR R-TOBACCO

YEAR	LEVELS (+)	LEVELS (*)	CHANGE (+)	CHANGE (*)
1955	11.990	14.212	0.000	0.000
1956	11.650	14.201	-2.836	-.078
1957	11.440	14.175	-1.803	-.192
1958	11.730	14.181	2.535	.055
1959	11.730	14.153	0.000	-.199
1960	11.820	14.145	.767	-.059
1961	12.000	14.148	1.523	.027
1962	11.800	14.153	-1.667	.030
1963	11.780	14.145	-.169	-.053
1964	11.530	13.986	-2.122	-1.127
1965	11.510	13.504	-.173	-3.446
1966	11.120	12.799	-3.388	-5.220
1967	10.790	12.003	-2.968	-6.217
1968	10.590	11.238	-1.854	-6.373
1969	10.040	10.572	-5.194	-5.926
1970	9.680	10.038	-3.586	-5.049
1971	9.520	9.677	-1.653	-3.600
1972	9.650	9.448	1.366	-2.365
1973	9.530	9.324	-1.244	-1.313
1974	9.410	9.254	-1.259	-.753
1975	9.140	9.209	-2.869	-.482
1976	8.780	9.181	-3.939	-.308



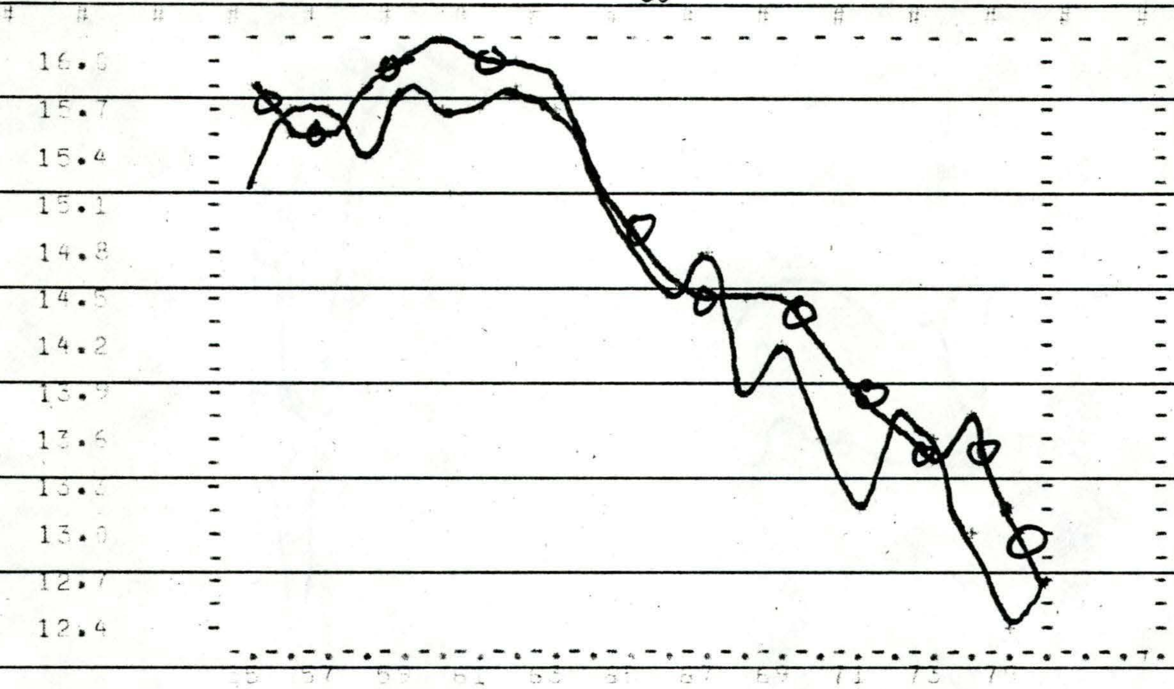
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 5-FATS/OILS

YEAR	LEVELS (+)	LEVELS (*)	CHANGE (+)	CHANGE (*)
1955	40.200	33.466	0.000	0.000
1956	39.800	34.620	-.995	3.449
1957	39.300	34.585	-1.256	-.101
1958	40.300	34.200	2.545	-1.115
1959	41.700	35.457	3.474	3.676
1960	41.000	35.541	-1.679	.236
1961	41.000	36.068	0.000	1.483
1962	41.800	37.220	1.951	3.193
1963	42.600	38.113	1.914	2.401
1964	43.900	40.711	3.052	6.814
1965	44.500	42.819	1.367	5.178
1966	47.200	44.787	6.067	4.596
1967	47.000	46.280	-.424	3.333
1968	48.700	47.623	3.617	2.902
1969	49.800	48.107	2.259	1.016
1970	50.900	49.028	2.209	1.916
1971	50.300	50.295	-1.179	2.584
1972	52.600	51.976	4.573	3.342
1973	52.700	53.825	.190	3.559
1974	51.800	51.014	-1.708	-5.224
1975	51.800	51.241	0.000	.446
1976	55.200	54.092	6.564	5.563



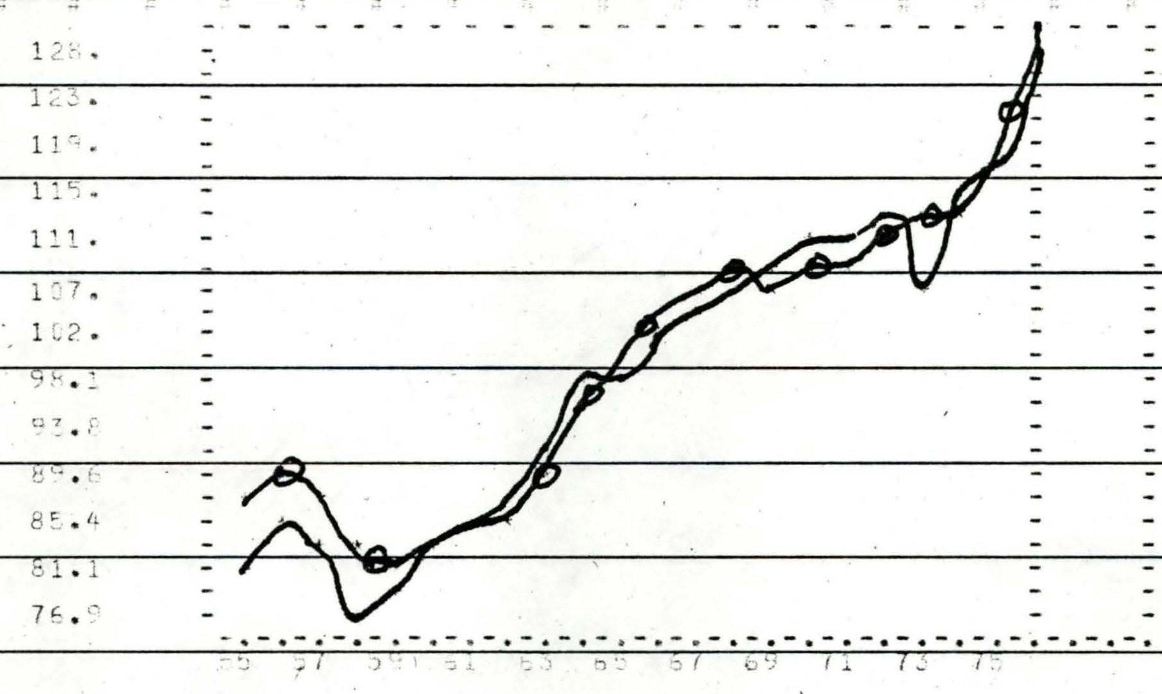
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 10-SUGAR

YEAR	LEVELS (+)	(*)	CHANGE (+)	(*)
1955	96.300	93.636	0.000	0.000
1956	97.800	94.105	1.558	.501
1957	95.000	94.053	-2.863	-.055
1958	96.800	93.949	1.895	-.111
1959	96.400	94.155	-.413	.220
1960	97.300	94.247	.934	.098
1961	97.800	94.407	.514	.170
1962	97.800	95.028	0.000	.658
1963	97.300	94.053	-.511	-1.026
1964	96.700	95.709	-.617	1.761
1965	96.800	97.411	.103	1.778
1966	97.200	98.212	.413	.822
1967	98.300	98.805	1.132	.604
1968	99.000	99.820	.712	1.028
1969	100.700	100.126	1.717	.306
1970	101.900	100.521	1.192	.395
1971	102.400	101.066	.491	.541
1972	102.800	101.887	.391	.813
1973	101.500	102.604	-1.265	.703
1974	96.600	95.171	-4.828	-7.244
1975	90.200	94.880	-6.625	-.306
1976	95.100	100.387	6.432	5.719



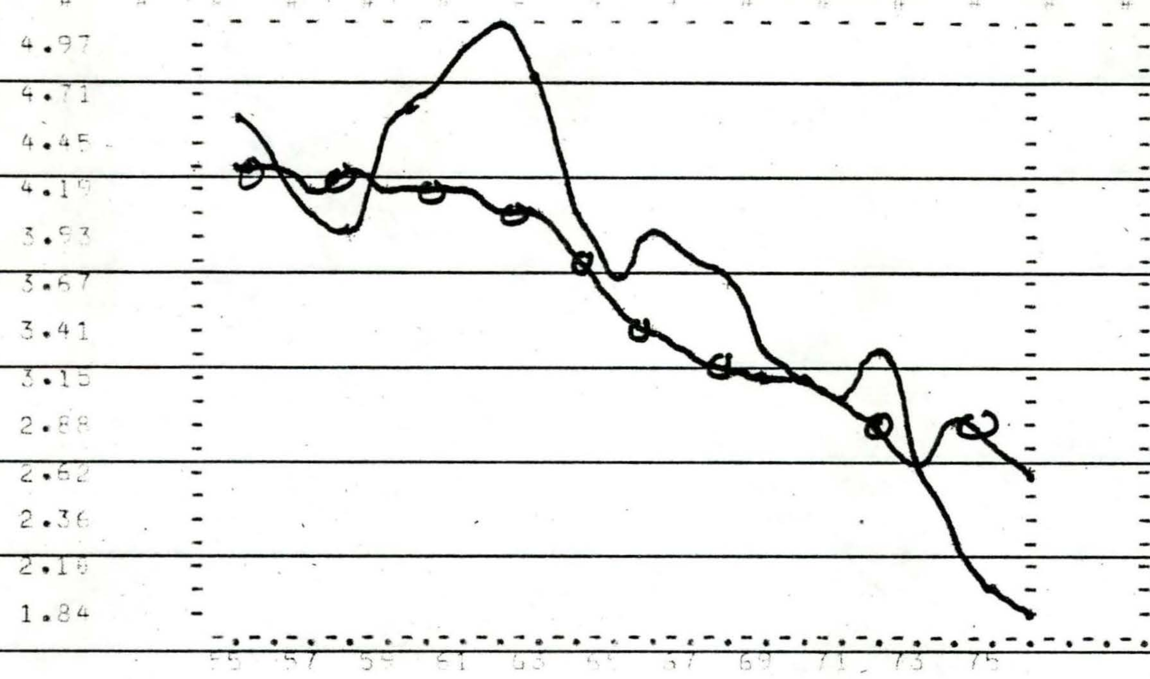
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 11-COFFEE

YEAR	LEVELS (+)	(*)	CHANGE (+)	(*)
1955	15.300	15.890	0.000	0.000
1956	15.800	15.560	3.268	-2.077
1957	15.700	15.648	-.633	.566
1958	15.500	15.964	-1.274	2.020
1959	15.900	16.061	2.581	.607
1960	15.800	16.150	-.629	.555
1961	15.800	16.112	0.000	-.235
1962	15.900	16.015	.633	-.600
1963	15.700	15.945	-1.258	-.439
1964	15.300	15.302	-2.548	-4.033
1965	14.800	14.952	-3.268	-2.286
1966	14.500	14.727	-2.027	-1.504
1967	14.800	14.643	2.069	-.572
1968	13.900	14.525	-6.081	-.805
1969	14.200	14.535	2.158	.066
1970	13.700	14.223	-3.521	-2.146
1971	13.200	14.029	-3.650	-1.365
1972	13.800	13.832	4.545	-1.405
1973	13.700	13.461	-.725	-2.679
1974	13.000	13.793	-5.109	2.465
1975	12.400	13.291	-4.615	-3.637
1976	12.800	12.746	3.226	-4.102



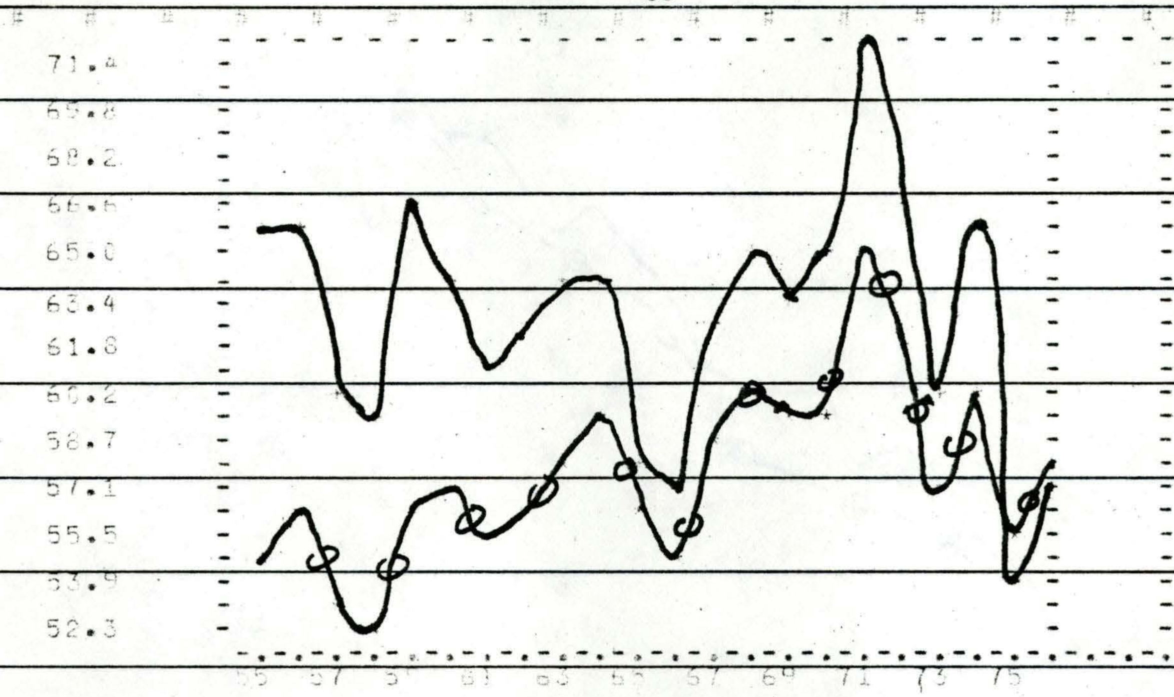
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 12-BEEF

YEAR	LEVELS (+)	LEVELS (*)	CHANGE (+)	CHANGE (*)
1955	82.433	87.496	0.000	0.000
1956	86.336	89.778	4.735	2.608
1957	83.298	89.007	-3.518	-.859
1958	76.889	83.280	-7.694	-6.434
1959	80.441	81.834	4.620	-1.736
1960	84.147	84.277	4.606	2.985
1961	86.900	86.077	3.272	2.136
1962	87.834	87.204	1.074	1.310
1963	93.393	90.460	6.329	3.733
1964	98.821	96.212	5.812	6.359
1965	98.395	100.946	-.431	4.921
1966	102.756	106.485	4.432	5.487
1967	104.906	107.841	2.093	1.274
1968	108.023	109.037	2.971	1.109
1969	109.146	107.523	1.040	-1.389
1970	112.198	110.231	2.797	2.519
1971	111.751	109.791	-.399	-.399
1972	114.955	111.407	2.867	1.473
1973	108.611	114.435	-5.519	2.718
1974	115.775	114.040	6.596	-.346
1975	119.210	119.707	2.967	4.969
1976	127.745	129.821	7.159	8.449



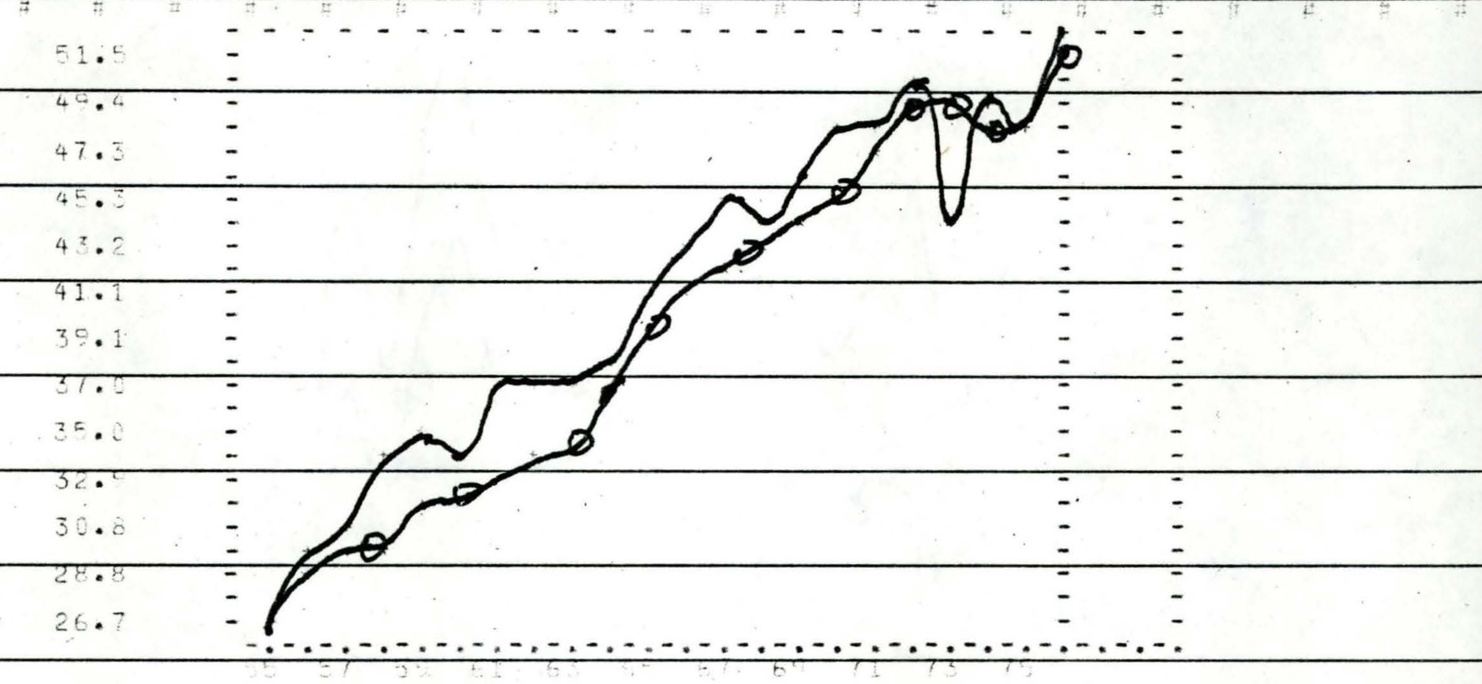
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 13-SHEEP

YEAR	LEVELS (+)	LEVELS (*)	CHANGE (+)	CHANGE (*)
1955	4.605	4.438	0.000	0.000
1956	4.424	4.328	-3.936	-2.493
1957	4.147	4.320	-6.260	-.176
1958	3.968	4.336	-4.299	.379
1959	4.701	4.266	18.464	-1.634
1960	4.733	4.280	.680	.342
1961	5.044	4.258	6.566	-.513
1962	5.106	4.149	1.223	-2.565
1963	4.815	4.066	-5.693	-2.009
1964	4.152	3.860	-13.774	-5.063
1965	3.696	3.651	-10.971	-5.153
1966	3.934	3.495	6.423	-4.533
1957	3.829	3.369	-2.653	-3.596
1968	3.686	3.262	-3.739	-3.195
1969	3.398	3.225	-7.810	-1.115
1970	3.215	3.148	-5.384	-2.401
1971	3.122	3.035	-2.887	-3.595
1972	3.281	2.897	5.090	-4.533
1973	2.652	2.750	-19.183	-5.061
1974	2.283	2.934	-13.895	6.656
1975	2.018	2.882	-11.612	-1.742
1976	1.839	2.665	-8.868	-7.551



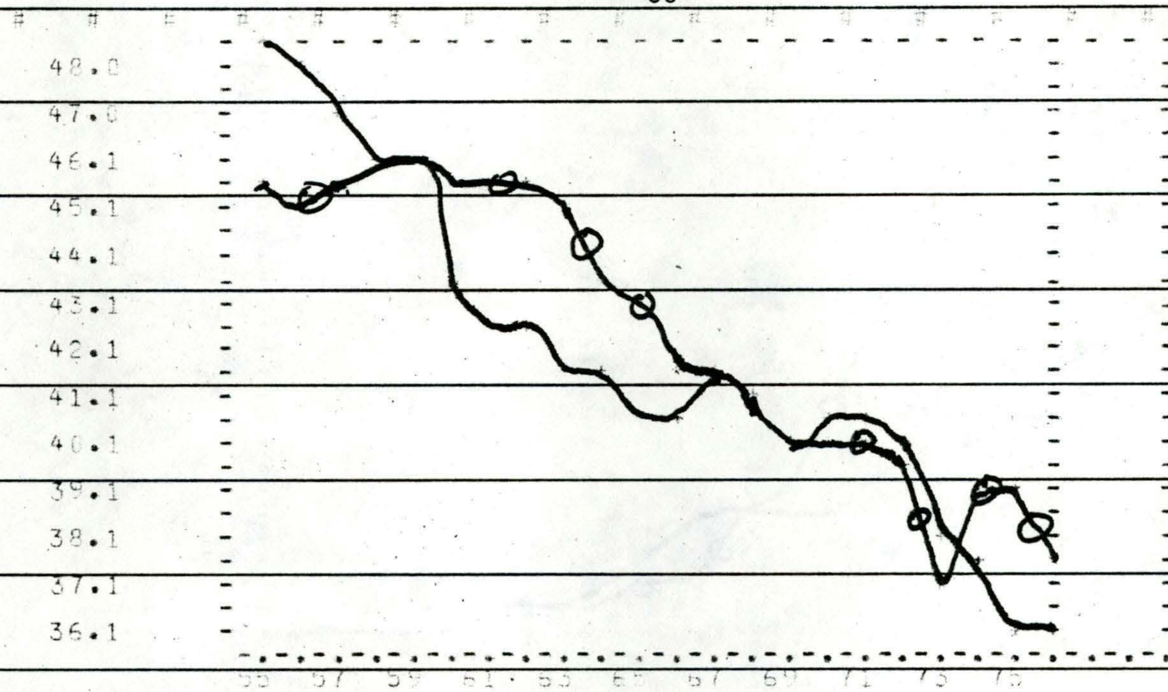
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 14-PORK

YEAR	LEVELS (+)	(*)	CHANGE (+)	(*)
1955	65.811	55.233	0.000	0.000
1956	66.414	56.837	.916	2.904
1957	60.394	53.417	-9.064	-6.017
1958	59.556	52.312	-1.389	-2.068
1959	66.819	56.414	12.196	7.842
1960	64.253	57.382	-3.840	1.715
1961	61.341	55.932	-4.531	-2.527
1962	62.790	57.048	2.361	1.995
1963	64.689	58.588	3.024	2.700
1964	64.634	60.109	-.084	2.597
1965	57.999	55.795	-10.265	-5.514
1966	57.363	54.962	-1.098	-3.228
1967	63.096	59.141	9.995	7.603
1968	65.107	60.888	3.188	2.955
1969	64.008	59.907	-1.688	-1.611
1970	65.544	60.113	2.400	.344
1971	72.151	65.746	10.080	9.370
1972	66.784	62.362	-7.438	-5.147
1973	61.038	57.773	-8.605	-7.359
1974	66.007	60.875	8.142	5.370
1975	54.329	56.254	-17.692	-7.591
1976	57.568	58.281	5.960	3.604



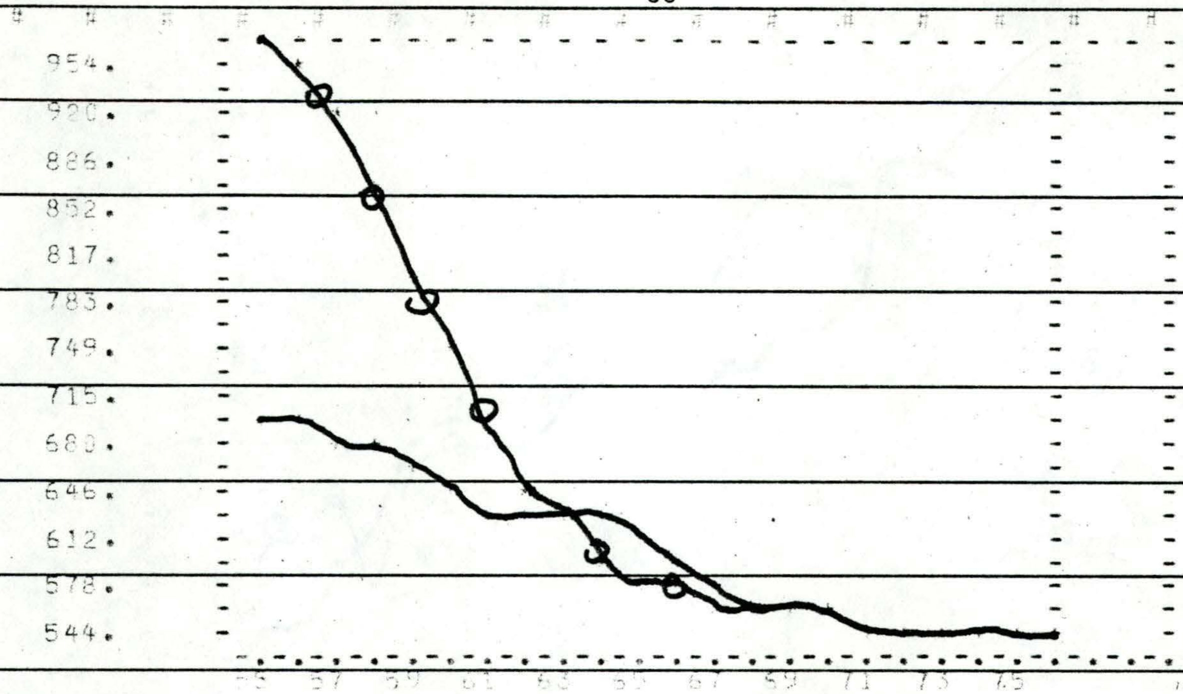
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 15-POULTRY

YEAR	LEVELS (+)	LEVELS (*)	CHANGE (+)	CHANGE (*)
1955	26.700	27.394	0.000	0.000
1956	30.000	29.296	12.360	6.944
1957	31.800	30.081	6.000	2.680
1958	34.400	30.454	9.176	1.240
1959	35.600	31.991	3.488	5.045
1960	34.400	31.998	-3.371	.023
1961	37.700	33.375	9.593	4.303
1962	37.300	34.166	-1.061	2.371
1963	38.050	34.844	1.877	1.984
1964	39.000	37.154	2.632	6.632
1965	41.300	39.465	5.897	6.218
1966	43.800	41.156	6.053	4.285
1967	45.500	43.083	3.881	4.682
1968	45.000	44.011	-1.099	2.156
1969	47.100	44.673	4.667	1.504
1970	48.900	46.308	3.822	3.659
1971	49.200	47.650	.613	2.898
1972	51.400	50.109	4.472	5.161
1973	44.600	49.810	-13.230	-.595
1974	50.400	49.065	13.004	-1.495
1975	49.300	49.380	-2.183	.642
1976	52.500	52.210	6.491	5.731



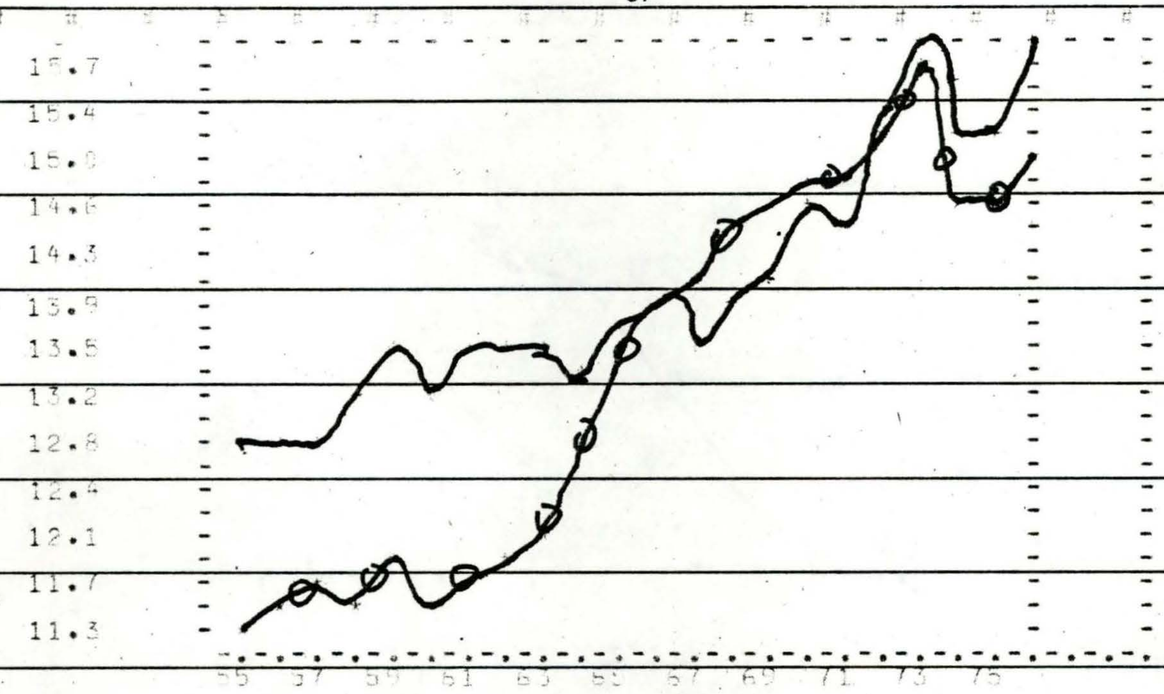
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 16-EGGS.

YEAR	LEVELS (+)	LEVELS (*)	CHANGE (+)	CHANGE (*)
1955	48.539	45.914	0.000	0.000
1956	48.278	45.463	-.539	-.982
1957	47.352	45.981	-1.897	1.139
1958	46.315	46.069	-2.210	.191
1959	46.053	46.366	-.565	.646
1960	43.829	45.984	-4.830	-.824
1961	42.913	45.750	-2.090	-.510
1962	42.783	45.612	-.305	-.300
1963	41.605	45.188	-2.752	-.929
1964	41.605	44.011	0.000	-2.607
1965	41.082	43.127	-1.258	-2.007
1966	40.951	41.626	-.318	-3.480
1967	41.867	42.014	2.236	.930
1968	41.343	41.248	-1.250	-1.823
1969	40.558	40.484	-1.899	-1.851
1970	40.689	40.362	.323	-.302
1971	41.082	40.556	.965	.481
1972	40.297	39.905	-1.911	-1.606
1973	38.465	37.313	-4.545	-5.494
1974	37.680	39.138	-2.041	4.891
1975	36.503	39.373	-3.125	.599
1976	36.110	37.922	-1.075	-3.684



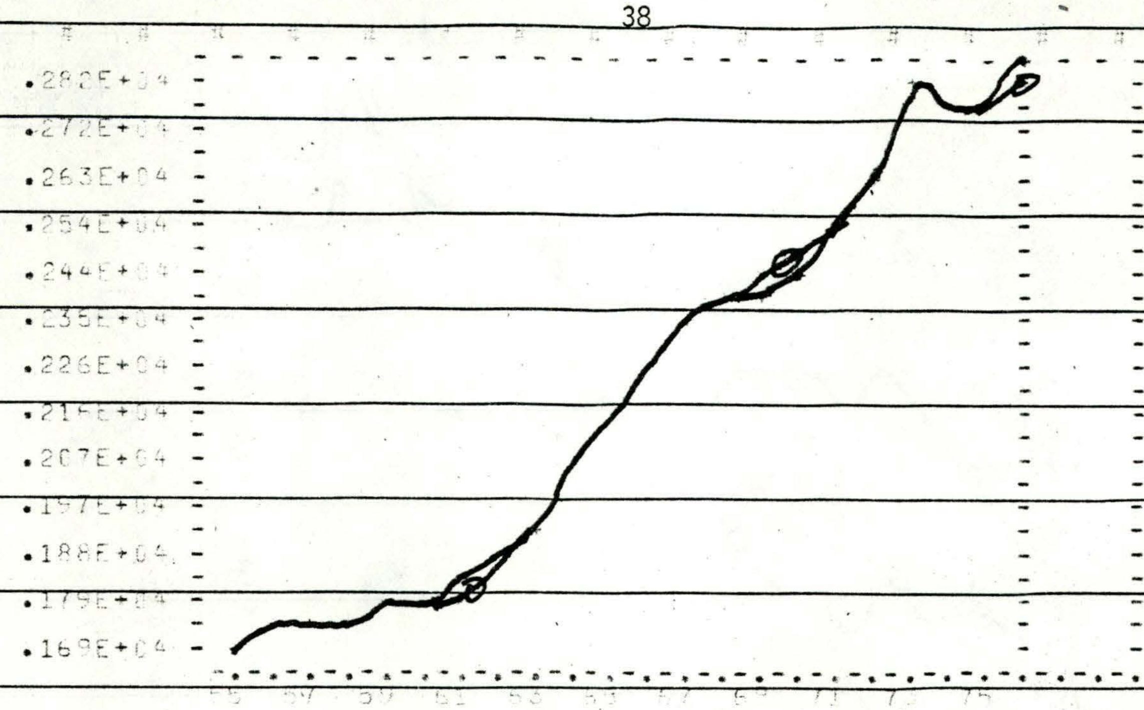
ACTUAL (+) AND ESTIMATED (*) VALUES FOR 17-MILK

YEAR	LEVELS (+)	(*)	CHANGE (+)	(*)
1955	706.000	971.271	0.000	0.000
1956	702.000	956.935	-.567	-1.476
1957	687.000	920.725	-2.137	-3.784
1958	682.000	873.912	-.728	-5.084
1959	667.000	814.202	-2.199	-6.833
1960	653.400	753.849	-2.039	-7.412
1961	641.200	700.400	-1.867	-7.090
1962	641.200	660.077	0.000	-5.757
1963	632.400	629.634	-1.372	-4.612
1964	632.400	608.644	0.000	-3.334
1965	619.800	593.450	-1.992	-2.496
1966	603.900	578.367	-2.565	-2.542
1967	581.000	566.706	-3.792	-2.016
1968	577.000	563.829	-.688	-.508
1969	568.700	562.551	-1.438	-.225
1970	561.400	560.750	-1.284	-.322
1971	557.700	558.826	-.659	-.343
1972	559.500	559.068	.502	.043
1973	554.500	556.875	-1.070	-.392
1974	543.600	545.908	-1.966	-1.969
1975	545.600	552.859	.368	1.273
1976	548.600	546.680	.550	-1.118



ACTUAL (+) AND ESTIMATED (*) VALUES FOR 18-FISH

YEAR	LEVELS (+)	LEVELS (*)	CHANGE (+)	CHANGE (*)
1955	12.900	11.327	0.000	0.000
1956	12.900	11.617	0.000	2.556
1957	12.800	11.708	-.775	.782
1958	13.300	11.653	3.906	-.471
1959	13.700	11.973	3.008	2.748
1960	13.200	11.518	-3.650	-3.798
1961	13.700	11.725	3.788	1.799
1962	13.600	11.906	-.730	1.538
1963	13.700	12.158	.735	2.120
1964	13.500	12.871	-1.460	5.868
1965	13.800	13.550	2.222	5.271
1966	13.900	13.973	.725	3.123
1967	13.600	14.132	-2.158	1.136
1968	14.000	14.604	2.941	3.345
1969	14.200	14.773	1.429	1.134
1970	14.800	14.950	4.225	1.217
1971	14.500	14.852	-2.027	-.654
1972	15.500	15.320	6.897	3.149
1973	15.900	15.824	2.581	3.291
1974	15.200	14.646	-4.403	-7.446
1975	15.200	14.756	0.000	.753
1976	15.900	14.995	4.605	1.623



ACTUAL (+) AND ESTIMATED (*) VALUES FOR 19-OTHERS

YEAR	LEVELS (+)	LEVELS (*)	CHANGE (+)	CHANGE (*)
1955	1716.069	1694.698	0.000	0.000
1956	1773.785	1752.822	3.363	3.430
1957	1778.476	1753.712	.293	.051
1958	1761.854	1741.566	-.962	-.693
1959	1805.820	1794.418	2.495	3.035
1960	1809.252	1800.971	.190	.315
1961	1836.464	1832.347	1.531	1.793
1962	1898.234	1895.771	3.336	3.461
1963	1945.061	1944.998	2.467	2.597
1964	2074.743	2073.413	6.667	6.602
1965	2194.834	2188.214	5.788	5.537
1966	2296.993	2291.996	4.654	4.743
1967	2361.766	2358.816	2.820	2.915
1968	2426.090	2426.809	2.724	2.882
1969	2449.413	2444.535	.590	.730
1970	2485.532	2490.566	1.851	1.883
1971	2559.521	2564.097	2.975	2.952
1972	2654.892	2663.028	3.726	3.858
1973	2838.668	2834.868	6.923	6.453
1974	2770.395	2777.638	-2.406	-2.019
1975	2788.738	2782.832	.662	.187
1976	2862.217	2857.759	2.635	2.692