JOURNAL OF ECONOMIC DEVELOPMENT
Volume 17, Number 1, June 1992

How Food Aid Affects Food Trade and How Food Trade Matters to the International Allocation of Food Aid

Roland Herrmann,
Carlo Prinz
and
Patricia Schenck*

This article provides a theoretical and empirical analysis of the relationship between food aid and food trade. It is often stressed that the implementation of food aid by the donors crucial for it success or failure. We show that domestic policies in the recipient countries are important, too. The way counterpart funds are spent determines whether developing countries become more or less dependent on food imports. Estimated food import demand funtions indicate that these funds ate rather used for demand than for supply subsidization. There is in most cases a less than one-to-one substitution of food imports by food aid. We then investigate which factors explain the allocation of the EC's food aid across countries. It is shown that self-sufficiency like other postulated criteria affects the allocation of food aid, however with a time lag.

I. Introduction

According to the FAO, food aid is defined as the transfer of food commodities from donor to recipient countries on a full grant basis or on highly concessional terms (FAO (a)). Four different types of food aid can be distinguished: emergency food aid, project aid, bulk supply and triangular transactions. Under emergency food aid, people affected by natural or man-made disasters receive food to cover short-term need.

* Institut für Agrarpol und Marktforschung der Justus Liebig-Universitut Senckenbergstr. 3 6300 Giessen, Germany.

Under project aid, food deliveries are tied to the implementation of projects mutually agreed upon by the donor and the recipient country. Special feeding programmes for target groups like infants, nursing mothers or school children may be forms of project aid as well as food-for-work programmes (Dearden and Ackroyd (1989), Henze, Augustin and Schneider (1982)). Major parts of project aid are distributed via the World Food Programme (von Braun, Huddleston (1988)). Bulk supply is an important type of non-project food aid where food deliveries flow to the recipient country and are sold there by the government through the normal market channels. So-called counterpart funds arise and are supposed to be used for development projects. Triangular transactions are a rather new form of food aid where the donor buys food from another developing country and donates it to the recipient country (Clay and Benson (1990)).

The following analysis concentrates on the linkages between food aid and food trade. Given its apparent significance for the balance of payments in food-deficit countries, this is an important issue in the economic evaluation of food aid. In general, there is an extensive economic literature on the pros and cons of food aid (Dearden, Ackroyd (1989), Srinivasan (1989), Lachmann (1988), Maxwell and Singer (1979), Isenman and Singer (1977)). Proponents of food aid stress that food security in developing countries improves as more food is available, and that food aid sets free financial resources for other projects of development policy. When food aid is given in the form of bulk supply, it is argued that the counterpart funds can be used to improve further the country's food situation. For example, technical progress in agriculture can be stimulated or targeted consumer subsidies can be given to the poor. On the other hand, opponents of food aid stress that recipient countries may become more import-dependent in foods for two reasons. Firstly, preferences may be changed in favour of imported foods. Secondly, an incentive is created for governments to rely upon food aid and to neglect agricultural development in their domestic policies.

To a large extent, the economic discussion on food aid is based on case studies and qualitative judgements. Theoretical and quantitative analyses on many aspects of food aid are lacking. Hence, it is the objective of this paper to elaborate important linkages between food aid and food trade theoretically as well as quantitatively. Two questions will be answered:

(i) How does the food trade of recipient countries respond to food aid?
(ii) Is the distribution of food aid by donors responsive to the food-deficit situation of potential recipients and to what extent?

Section 2 is concerned with the first question. We analyze within a

theoretical model how food trade responds to changes in food aid and what the determinants of the response are. The model concentrates on the bulk-supply type of food aid and stresses how counterpart funds are spent in the recipient countries. Then import demand functions are estimated econometrically in order to measure the influence of food aid on food trade of selected developing countries.

Section 3 deals with the second question. The determination of the international allocation of the EC's cereal food aid are elaborated within a cross-country multiple-regression approach. We test whether the allocation of aid follows postulated criteria and whether the dependence on food imports affects the received quantities of food aid. Finally, the major results are summarized and some policy-relevant conclusions are drawn.

II. The Impact of Food Aid on Food Trade

In this section we analyze how food aid affects food trade. The impact will be investigated first within a theoretical framework. Then import demand functions will be estimated econometrically in order to quantify the relationship between food aid and food trade for selected food-deficit countries.

A. The Basic Analytics on the Impact of Food Aid

Does food aid lead to less food imports and, thus, contribute to a solution of balance-of-payments problems in developing countries? If the answer is yes, to what extent does food aid reduce food imports? In order to tackle these questions, we use a stylized model for the market of a food staple in a developing country. The analysis is comparative-static and, hence, concentrates on the direct and short-run rather than on the indirect and long-run effects of food aid on trade. It ignores the general-equilibrium repercussions of food aid which would be beyond the scope of this paper. Despite the stylized nature of the model, it will contain a structure sufficient to draw some important theoretical conclusions on the impacts of food aid on food trade. In particular, we incorporate one essential feature of food-aid policy — the use of counterpart funds in the recipient countries. Counterpart funds arise when food aid is given in the form of bulk supply. The beneficiary country's government receives the physical quantities of food and is responsible for its distribution. When the food is sold on the domestic market, the counterpart funds flow to the government. They are equal to the quantity sold times the domestic market price. The government may then use the counterpart funds either in the

food or in the non-food sectors of the economy. It will be shown that the trade impact of food aid depends crucially on the use of these counterpart funds in the recipient country. This implies that domestic policy in the recipient country is important for the trade effect of food aid. We distinguish four cases. In Case 1, no use is made of counterpart funds in the food sector. Counterpart funds are spent in the food sector, however, in Cases 2 to 4. They are used for the subsidization of food demand (Case 2), food supply (Case 3) or both (Case 4).

a) No use of counterpart funds in the food sector (Case 1)

Suppose now that the food sector of a small developing country is characterized by the following basic model:

(1) $S^{PR} = a + b \cdot p$

(2) $S^{GO} = 0$

or

(2') $S^{GO} = \overline{FA}$

(3) $D^{PR} = c = d \cdot p$

(4) $p = e + f \cdot pw$

(5) $pw = \overline{pw}$

(6) $S = S^{PR} + S^{GO} + M$

(7) $S = D^{PR}$

Food supply (S) in this country is composed of private supply (S^{PR}), supply by the government (S^{GO}) and imports (M). Supply by the government is zero in the non-food-aid case (equation (2)) and is equal to an exogenously given amount of food aid ($\overline{FA}$) in the food-aid situation (equation (2')). Food demand in the country is only private demand (D^{PR}). As formulae (1) and (3) show, private food supply and private food demand are a function of the price on the domestic market (p). The domestic food price is a function of the world food price (pw). Equation (4) characterizes a price transmission equation as often used in agricultrual policy analysis (see e.g. Gardner (1987)). Differences between the domestic and the world price may be due to transport costs and national food price policies (on the importance of both factors, see Byerlee, Sain (1986)). Equation (5)

describes the small-country case; changes in traded quantities by the respective country do not alter the world price, a, b, c, d, e and f are coefficients of the model. The theoretical expectations on the signs are: $a>0$, $b>0$, $c>0$, $d>0$, $e>0$ and $f>0$.

Food imports are included in equation (6). Equation (6) can be rewritten after including (7) as

$$(8) \qquad M = D^{PR} - S^{PR} - S^{GO}$$

For the situation with food aid, M can be calcualted from the model (1), (2'), (3) and (8):

$$(9) \qquad M = c + d \cdot p - a - b \cdot p - \overline{FA}$$

The reference value of food imports in the situation without food aid is indicated by the subscript 0. It can be computed from (1), (2), (3) and (8) as:

$$(10) \qquad M_0 = c + d \cdot p - a - b \cdot p.$$

Consequently, the impact of food aid on food trade in the basic model is:

$$(11) \qquad \Delta M = M - M_0 = -\overline{FA}$$

This implies that an increase in food aid by one metric ton reduces food imports by one metic ton. There is a one-to-one substitution of food imports by food aid.

The basic model above rests upon an extreme assumption on the use of the counterpart funds. The funds do not affect the domestic supply of or the domestic demand for food. This can only be justified when the funds are utilized in the non-food sector and when links between the food and non-food sectors can be ignored. Both assumptions are restrictive and we will relax the first assumption in the following. One major argument for food aid is that additional funds become available for improving a country's food security. Such an improvement might be realized by subsidizing food demand or by subsidizing food production. These two alternatives will now be discussed.

b. Use of counterpart funds for subsidizing food demand (Case 2)

Suppose now that counterpart funds arise from the bulk supply of

food aid. The recipient country's government is assumed to anticipate these funds and to spend it for shifting the demand curve to the right. One possible policy of this type would be an income transfer to the poor. In such a situation, we have to replace equation (3) by

$$(3') \qquad D^{PR} = c + d \cdot p + g \cdot (\alpha \cdot p \cdot \overline{FA})$$

When the quantity $\overline{FA}$ is given to the government and then sold at the domestic price p, this yields counterpart funds in the magnifude of $(p \cdot \overline{FA})$. We posit that a share α of these counterpart funds is given to the population which demands food whereby $0 < \alpha < 1$. Basically, this leads to an income effect. The coefficient $g(>0)$ indicates how food demand increases when income rises by one monetary unit. The described use of counterpart funds alters the impacts of food aid on food imports. Food imports can now be derived from equations (1), (2'), (3') and (8) as follows:

$$(12) \qquad M^* = c + d \cdot p + g \cdot (\alpha \cdot p \cdot \overline{FA}) - a - b \cdot p - \overline{FA}.$$

Comparing (12) with (10) yields the following effect of food aid on food trade:

$$(13) \qquad (\Delta M)^* = M^* - M_0 = g \cdot (\alpha \cdot p \cdot \overline{FA}) - \overline{FA}.$$

Equations (13) and (11) indicate that the negative impact of food aid on food trade becomes weaker when counterpart funds are used for the subsidization of food demand: $(\Delta M) < (\Delta M)^*$. When food aid increases by one metric ton, food imports decrease by less than one metric ton. Moreover, equation (13) show the counter-intuitive result that food aid will not in all cases reduce food trade, even in the short run. Food aid can even increase food imports. This is the case when $(g \cdot \alpha \cdot p) > 1$, i.e. when the shift in the food-demand curve to the right due to food subsidization overcompensates the increased avialability of food as a consequence of food aid. In general, it holds true that the impact of food aid on food imports can be negative, positive or zero $((\Delta M)^* \gtreqless 0)$.

c. Use of counterpart funds for subsidizing food production (Case 3)

The goal of self-sufficiency is a major goal of agricultural policy in many developing countries. Hence, policies which aim at stimulating domestic production are stressed in most countries. The counterpart funds, which arise from the bulk-supply type of food aid, can be used in a developing country exactly for this purpose. Domestic food production can be stimulated, and the supply curve can be shifted to the right. Possi-

ble policies along these lines are intended to stimulate technical change in agriculture or to subsidize inputs. Suppose now that a certain share β of the counterpart funds is used for stimulating technical progress in domestic food production. β ranges between 0 and 1. Then private supply in the food-aid case can no longer be represented by equation (1) but is given by

$$(1') \qquad S^{PR} = a + b \cdot p + h \cdot (\beta \cdot p \cdot \overline{FA})$$

h indicates the responsiveness of domestic food production to an additional monetary unit spent on technical change in agriculture. The theoretical expectation is that $h > 0$. In Case 3, food imports are determined by the model (1'), (2'), (3) and (8). It follows that

$$(14) \qquad M^{**} = c + d \cdot p - a - b \cdot p - h \cdot (\beta \cdot p \cdot \overline{FA}) - \overline{FA}$$

The comparison of (14) and (10) leads to the following effect of food aid on food trade:

$$(15) \qquad (\Delta M)^{**} = M^{**} - M_0 = -h \cdot (\beta \cdot p \cdot \overline{FA}) - \overline{FA}$$

Equation (15) reveals that the impact of food aid on food imports is again negative in Case 3. Compared with equation (11), it can be seen that this is even more so than in Case 1: $(\Delta M)^{**} < (\Delta M)$. An increase of food aid by one metric ton reduces food imports by more than one metric ton. The economic explanation is straight-forward: food imports are directly substituted by food aid. Additionally, the use of counterpart funds for shifting domestic production to the right will further reduce the country's food imports.

d. Use of counterpart funds for subsidizing food demand and food production (Case 4)

The arguments presented in Cases 2 and 3 can now be integrated within a single model. It is assumed that counterpart funds are used partly for the stimulation of food demand ($0 < \alpha < 1$) and partly for the stimulation of food supply ($0 < \beta < 1$). The additional assumption $(\alpha + \beta) \leqslant 1$ guarantees that counterpart funds can be partly spent in the non-food sector, too. The model consists now of equations (1'), (2'), (3') and (8), and each case discussed above is a special case of this more general model. Food imports are then:

$$(16) \qquad M^{***} = c + d \cdot p + g \cdot (\alpha \cdot p \cdot \overline{FA}) - a - b \cdot p - h \cdot (\beta \cdot p \cdot \overline{FA}) - \overline{FA}$$

The impact of food aid on food imports is now:

$$(17) \qquad (\Delta M)^{***} = M^{***} - M_0 = g \cdot (\alpha \cdot p \cdot \overline{FA}) - h \cdot (\beta \cdot p \cdot \overline{FA}) - \overline{FA}$$

Furthermore, it holds true that

$$(18) \qquad (\Delta M)^{***} \lesseqgtr 0$$

and

$$(19) \qquad (\Delta M)^{**} < (\Delta M)^{***} < (\Delta M)^{*}$$

Food imports may be lowered or raised by food aid when the use of counterpart funds in the food sector is captured by the model. An eventual reduction of food imports is highest in Case 3, followed by Case 4 and then Case 2. In order to elaborate in more detail the determinants of the trade effect, equation (17) can be differentiated partially with respect to its determinants. It follows that:

$$(20) \qquad \delta(\Delta M^{***}) / \delta \overline{FA} = (g \cdot \alpha - h \cdot \beta) \cdot p - 1 \lesseqgtr 0$$

$$(21) \qquad \delta(\Delta M^{***}) / \delta p = g \cdot \alpha - h \cdot \beta \lesseqgtr 0$$

$$(22) \qquad \delta(\Delta M^{***}) / \delta \alpha = g \cdot p \cdot \overline{FA} > 0$$

$$(23) \qquad \delta(\Delta M^{***}) / \delta g = \alpha \cdot p \cdot \overline{FA} > 0$$

$$(24) \qquad \delta(\Delta M^{***}) / \delta \beta = -(h \cdot p \cdot \overline{FA}) < 0$$

$$(25) \qquad \delta(\Delta M^{***}) / \delta h = -(\beta \cdot p \cdot \overline{FA}) < 0$$

The results show that food aid is more likely to lead to a substitution of food imports:

- the lower the share of counterpart funds that is used for demand subsidization, i.e. the lower α is;
- the weaker the response of the population to increasing incentives for food demand, i.e, the lower g is;
- the higher the share of counterpart funds that is used for supply subsidization, i.e. the higher β is;
- the stronger the response of food producers to increasing incentives for food production, i.e, the higher h is.

Equations (20) and (21) show that the impact of food aid on food imports may increase or decrease with a higher amount of food aid and higher domestic prices. In any case, it is important whether the use of counterpart funds leads to a stronger shift of the demand or supply curve. When the supply shift is larger ($h \cdot \beta > g \cdot \alpha$), food aid will lead to a stronger substitution of food imports:

— the higher the amount of food aid, i.e. the larger $\overline{FA}$ is:
— the higher the domestic price of food, i.e. the higher p is.

Of course, the preceding analysis does not cover all aspects that are important in studying linkages between food aid and food trade. Some examples demonstrate this clearly: there may be a long-run impact of food aid on food trade leading to a change in preferences when different qualities of food are considered. This will, ceteris paribus, often lead to an increased dependence on the imported and urban food. This effect is not captured by the model, as preferences are assumed to be equal in the food-aid and non-food-aid situations. Moreover, food aid might well be something like an "engine for trade" in the non-food sector when income effects there are taken into account. Furthermore, several authors stress the segmented-market hypothesis with no price transmission to the world market (Sarris (1990)). In this case, food aid causes the well-konwn price-disincentive effect even for the small developing country. All these arguments imply that the above model should be altered when these arguments are relevant for a country and when a comprehensive analysis is aimed at.

Despite the stylized nature of our model, a major result was derived that will remain valid in virtually all relevant model specifications: food aid can raise or lower food imports when the use of counterpart funds is taken into account. In the following we consider what the empirical relationship between food aid and food trade looks like.

B. Empirical Results on the Impact of Food Aid on Food Trade

The impact of food aid on food imports is complex and country-specific and, as the theoretical considerations have shown, depends to a high degree on the national utilization of the counterpart funds. Some earlier studies on that subject suggested quite consistently that in may countries the substitution of food aid for commercial food imports is high, although varying methodologies were used. In previous samples average rates of substitution were calculated in the range of 0.7-0.8 for most countries on the basis of data for the 1960s and 1970s (Hall (1980), Nelson et al. (1981)).

In order to quantify the effects of food aid on food trade taking into consideration the use of counterpart funds, we estimated import demand functions for selected LDCs which receive significant amounts of food aid. As cereals are the main food-aid products with regard to delivered quantities (FAO (a)), our analysis focuses on cereals.

The specification of import demand functions for grain has been discussed in several studies (Abbott (1979), Chase Wilde (1987), Jabara (1982), Mitchell (1985)). According to these studies, basic explanatory variables for import demand are the level of domestic income in the importing country, the price of imports and the level of domestic supply, assuming that imports and domestic goods are substitutes.[1] Moreover, an additional variable must be taken into account which captures the delivered amount of food aid to the country in question.

Hence, the following estimations are based on the import demand function:

$$(26) \qquad q^{im} = f(p_w, \text{GDP}, \text{PROD}, \text{FA})$$

where q^{im} represents the quantity of net cereal imports and p_w the country-specific import price for cereals. GDP is the income variable measured by the gross domestic product, PROD stands for domestic production of cereals and FA for the quantity of cereal food aid the country in question received.

Net imports are expected to be positively related to income and negatively related to the import price and domestic production (Jabara (1982)). According to theory, the effect of food aid on commercial imports is uncertain because it depends on the use of the counterpart funds.

Hence, the signs of the estimated coefficients should be:

$$\frac{\delta q^{im}}{\delta p_w} < 0; \quad \frac{\delta q^{im}}{\delta \text{GDP}} > 0; \quad \frac{\delta q^{im}}{\delta \text{PROD}} < 0; \quad \frac{\delta q^{im}}{\delta \text{FA}} \gtreqless 0$$

The countries examined are Peru, Botswana, Egypt, Morocco and Sudan. Food aid is relatively important for all these countries, as Table 1 shows. The share of food aid in domestic production and net imports has increased in nearly all cases. The values of 10 or more percent indicate the

1 Because of the large number of grain trading countries it is likely that an importing country can find a variety and quality of grain which is a close substitute for its domestically-produced grain (Mitchell (1985), p 8).

Table 1

IMPORTANCE OF CEREAL FOOD AID IN SELECTED LDCs

Country	Food aid as percentage of			
	domestic cereal production		net imports of cereals	
	1971-75	1981-85	1971-75	1981-85
Peru	3.1	8.1	5.4	12.0
Botswana	5.9	147.5	12.2	17.5
Egypt	3.9	22.3	13.6	24.1
Morocco[a]	11.6	12.8	35.9	16.4
Sudan[a]	20.3	298.5	28.3	66.4

a) The numbers are related to food aid, production and net imports of wheat.
Sources: FAO (a), FAO (1987), FAO (d) and author's computations.

considerable role of food aid for domestic supply in each country over the observed 15-year period.

The five nations are typical small countries in the world grain market,[2] i.e. they are price takers. This implies that the national import price is exogenously determined by world market conditions. Empirical evidence for developing countries indicates that production is price-inelastic in the short run but rather elastic in the medium or long run (Peterson (1988), Askari and Cummings (1976)). Therefore domestic production can be assumed to be not affected by world price changes within a given year. Assuming that there is no simultaneity problem, OLS estimations were used for all countries.

As the theoretical considerations are based on a linear model, estimations of import demand were made with linear models first. A negative sign of the calculated food-aid coefficient indicates that imports are substituted by food aid; a positive sign shows that increasing food aid leads to increasing imports. According to the theoretical considerations, the coefficient must be a value between 0 and -1 or must carry a positive sign if counterpart funds are primarily used for demand subsidization. On

2 According to FAO (d), the countries examined had the following import shares of world cereal imports during the period 1981-85: Peru 0.91, Botswana 0.05, Egypt 3.51, and concerning wheat Morocco 1.91 and Sudan 0.51.

the other hand, if counterpart funds run into production subsidies, a value of less than -1 can be expected.

Table 2 presents the regression models which performed best in the specification search. In all cases, q^{im} or q^{im}/C represent the countries' net imports of cereals in 1,000 mt or kg/capita respectively. In Egypt, Morocco and Sudan, the national import price of cereals was measured in domestic currency per metric ton ($p_w{}^d$). GDP/C^d stands for the per-capita gross domestic product in national currency. In these countries, both price series were converted into real terms (indicated by the index r) using the national consumer price index or a GDP deflator in order to eliminate the influence of inflation. The use of real prices implies that importers exhibit no money illusion (Jabara (1982)). In Peru and Botswana, the import price of cereals was measured in US$/mt and the gross domestic product in Million US-Dollars or US-Dollars per capita both in nominal terms, because the regression results computed with real prices and income were unsatisfactory.

PROD (PROD/C) represents the domestic cereal production in 1,000 mt (kg/capita) and FA (FA/C) stands for the delivered quantity of food aid in 1,000 mt (kg/capita). t and t-1 are the two periods considered. The values in parentheses are t-values and δ is the estimated coefficient of the Cochrane/Orcutt procedure for modelling first-order autocorrelation. $\bar{R}^2$ is the corrected coefficient of determination, F is the F-value and DW the Durbain/Watson coefficient. The levels of significance of the estimated coefficients are indicated by * for 95% and ** for 99%.

Given the common test statistics, the overall performance of the models is rather good. In all cases the estimated coefficients of the food aid variable are significantly different from zero. Moreover, all significant coefficients have the expected signs, so that economic theory is confirmed.

The results can be interpreted in the following way. Important determinants of import demand are the domestic income and production as well as food aid deliveries, whereas the import price appears to have no significant influence on imports except in Botswana. Because of the close linkages between cereal prices in Botswana and price policy in the Republic of South Africa under the Southern African Costums Union (Cathie and Herrmann (1988)), the explanation of this price reaction is difficult and goes beyond the scope of this study.

Remarkable is the rather high coefficient of the lagged production variable in Egypt. A rise in domestic cereal production of 1 kg per capita in one year leads to decreasing imports by 1.55 kg per capita in the next year.

Table 2

LINEAR ESTIMATIONS OF CEREAL IMPORT DEMAND FUNCTIONS FOR SEVERAL COUNTRIES 1971-87[a]

Peru:

$$q^{im}/C_t = 76.7562^{**} + 0.0270\ p_w^{\$,n_t} + 0.0230^{**}\ GDP^{\$,n}/C_t$$
(4.87) (0.75) (4.37)
$$-0.2626\ PROD/C_t - 0.8631^{*}\ FA/C_t$$
(−2.28) (−2.28)
$\bar{R}^2 = 0.67$ DW = 2.41 F = 9.26

Botswana:

$$q^{im}{}_t = 193.9497^{**} - 0.7372^{**}\ p_w^{\$,n_t} + 0.1514^{**}\ GDP^{\$,\ n_t}$$
(6.40) (−4.62) (3.82)
$$-0.7955^{**}\ PROD_t - 1.9854^{*}\ FA_{t-1}$$
(−4.03) (−2.40)
$\bar{R}^2 = 0.81$ DW = 2.22 F = 16.86

Egypt:

$$q^{im}/C_t = 349.1963^{*} + 0.0653\ p_w^{d,r_t} + 0.1673\ GDP^{d,\ r}/C_{t-1}$$
(2.80) (0.55) (0.97)
$$-1.5486^{**}\ PROD/C_{t-1} + 1.0343^{*}\ FA/C_t$$
(−3.47) (2.39)
$\bar{R}^2 = 0.88$ DW = 1.49 F = 31.72

Morocco[b]:

$$q^{im}/C_t = -59.4455 + 0.0012\ p_w^{d,r_t} + 0.0578^{**}\ GDP^{d,r}/C_t$$
(−1.16) (0.10) (4.88)
$$-0.7581^{**}\ PROD/C_t + 0.9651^{*}\ FA/C_t$$
(−6.61) (2.35)
$$\delta = -0.6275^{*}$$
(−2.33)
$\bar{R}^2 = 0.66$ DW = 2.35 F = 20.32

Sudan[b]:

$$q^{im}/C_t = 40.8793^{**} - 15.9464\ p_w^{d,r_t} - 0.0685\ GDP^{d,r}/C_t$$
(3.54) (−0.38) (−1.65)
$$-0.7808\ PROD/C_t + 0.4697^{*}\ FA/C_t$$
(−1.77) (2.85)
$\bar{R}^2 = 0.81$ DW2.19 F = 18.42

a) For the explantion of variables and statistical parameters see the text.
b) These computations refer to import demand of wheat.
Sources: FAO (1987), FAO (a), FAO (b), FAO (d), International Monetary Fund, World Bank and author's computations.

The most interesting values for our analysis, however, are the estimated coefficients of the food-aid variable. In three out of five cases, this coefficient carries a positive sign, i.e. a rise in food aid per capita by 1 kg leads to increasing imports per capita by 0.47 to 1.03 kg. In these countries, food-aid deliveries more or less intensify commercial imports. The relatively high value in Egypt is confirmed by earlier studies (von Braun (1980), Jabara (1982)). An explanation for this coefficient arises from the fact that food aid deliveries to Egypt are highly governed by the so-called "Usual Marketing Requirements," meaning that the country is obliged to purchase an additional amount of commercial imports. Moreover, Egypt has long-term supply agreements with several countries which are more or less independent of uncertain food aid deliveries (von Braun (1980)). For Peru and Botswana, the estimated coefficients indicate a substitution between food aid and commercial food imports. The strongest degree of substitution was found in Botswana: increasing food-aid deliveries by 1 mt cause a decline in commercial imports of nearly 2 mt. Our theoretical analysis suggests that this result might be due to the fact that counterpart funds in Botswana are primarily used for the subsidization of production. Furthermore, the positive coefficients in most countries indicate that the shift of the food demand curve due to food subsidization must be greater than the shift of the supply curve due to increasing domestic supply as a consequence of food aid, assuming that prices are unaffected.

Besides, log-linear models of import demand were estimated with the same data basis. This functional form was expected to fit better and its estimated coefficients can easily be interpreted as elasticities. The results are presented in Table 3. The following interpretations are possible.

Peruvian cereal imports increase significantly with a growth in income and decrease with a rising domestic production of cereals and with rising food aid deliveries. As in the linear model the import price has no significant influence on import demand. The estimated elasticities confirm the results of earlier studies (Chase Wilde (1987), Herrmann (1990)). The estimated coefficient of the food-aid variable is almost zero. The negative sign indicaties that cereal imports are partly substituted by food aid.

For Botswana, the domestic cereal production was found to be the most important factor in determining food imports. Increasing domestic production by 1% leads to decreasing imports by 0.5%. The import price as well as the national income appeared to have no significant influence on imports. Low or insignificant price elasticities, however, support the theory that domestic pricing policies are effective in insulating domestic markets from a change in the world price (Chase Wilde (1987)). Concern-

Table 3

LOG-LINEAR ESTIMATIONS OF CEREAL IMPORT DEMAND FUNCTIONS FOR SEVERAL COUNTRIES, 1971-87[a]

Peru:

$$\ln q^{im}/C_t = 3.7604^{**} - 0.0159 \ln p_w^{\$,nt} + 0.3702^{**} \ln GDP^{\$,n}/C_t$$
(3.84) (−0.18) (4.20)
$$-0.4015^{*} \ln PROD/C_t - 0.0609^{*} \ln FA/C_t$$
(−2.24) (−2.24)
$\bar{R}^2 = 0.67$ DW = 2.29 F = 9.01

Botswana:

$$\ln q^{im}{}_t = 9.1733^{**} - 0.8332 \ln p_w^{\$,nt} + 0.1037 \ln GDP^{\$,nt-1} - 0.5024^{**} \ln PROD_t$$
(4.72) (−1.61) (0.32) (−3.51)
$$+ 0.2087 \ln FA_t$$
(1.37)
$\bar{R}^2 = 0.70$ w = 1.81 F = 9.66

Egypt:

$$\ln q^{im}/C_t = 20.2491^{*} + 0.2366 \ln p_w^{d,rt} - 0.2018 \ln GDP^{d,r}/C_{t-1}$$
(2.69) (1.87) (−0.35)
$$-3.1377^{**} \ln PROD/C_{t-1} + 0.3833^{**} \ln FA/C_t$$
(−3.16) (3.03)
$\bar{R}^2 = 0.87$ DW = 2.00 F = 25.58

Morocco[b]:

$$\ln q^{im}/C_t = -20.2698^{**} + 0.1334 \ln p_w^{d,rt} + 3.3603^{**} \ln GDP^{d,r}/C_t$$
(−3.51) (0.83) (5.57)
$$-0.8518^{**} \ln PROD/C_t + 0.0774 \ln FA/C_t$$
(−5.52) (1.24)
$\bar{R}^2 = 0.70$ DW = 2.08 F = 20.06

Sudan[b]:

$$\ln q^{im}{}_t = 6.6130 - 0.5812^{*} \ln p_w^{d,rt} + 0.1764 \text{ in } GDP^{d,rt} - 0.9632^{**} \ln PROD_t$$
(2.07) (−2.45) (0.38) (−4.78)
$$+ 0.2662^{**} \text{ in } FA_t$$
(4.60)
$\bar{R}^2 = 0.90$ DW = 2.19 F = 38.52

a) For the explanation of variables and statistical parameters see the text.
b) These computations refer to import demand of wheat.
Sources: FAO (1987), FAO (a), FAO (b), FAO (d), International Monetary Fund, World Bank and authors' computations.

ing the linkage between food aid and food trade, no statements are possible.

The following three models differ from the other models by the use of prices and income in real terms. In Egypt again, the lagged production variable is rather important in explaining cereal imports. As in the case of the linear models, the reaction of imports to rising production is very strong: increasing cereal production per capita by 1% causes a decline in imports per capita of 3.14%. Moreover, the food aid variable turns out to affect imports significantly. The positive sign of the estimated coefficient indicates that food aid has a positive impact on commercial imports, i.e. food aid stimulates food imports.

In Morocco, wheat imports per capita increase significantly with rising domestic income per capita in real terms and decrease with growing per-capita production. The income elasticity is very high: a rise in domestic income per capita by 1% leads to increasing imports by 3.36%. The production elasticity is slightly higher than the ones measured for Peru and Botswana. Like in Botswana in the log-linear model, the food-aid variable showed no significant influence on imports.

Import demand in Sudan is negatively affected by the real import price and domestic production, whereas the impact of food aid on food trade is significantly positive. The production elasticity is comparable with the one of Morocco. As in the case of Egypt, rising food aid deliveries lead to increasing imports. In these two countries, food aid acts as an "engine for trade."

Summing up, the main conclusion can be drawn, that the impact of food aid on food trade varies from country to country. Therefore, no uniform statement is possible. Food aid was found to either displace or stimulate commercial food imports, i.e. the estimation results correspond with the theoretical considerations. Moreover, the findings suggest that counterpart funds are more likely to be used as a means of demand subsidization than of production subsidization.

III. Does Import Dependence in Food Affect the International Allocations of Food Aid? A Quantitative Analysis for the EC's Food Aid Policy

Up to now, food aid has been treated as an exogenous variable from the individual recipient country's point of view. We then analyzed how the country's food imports are affected by changes in food aid. In the following, food aid will be treated as an endogenous variable on which the donor country decides according to certain criteria. Determinants of

the international allocation of food aid will now be elaborated for the EC's food aid policy. Besides officially declared criteria for the distribution of food aid, we will test whether import dependence in food is significant for the amount of food aid a country receives. The supply of food aid is based upon a motivation mix, where the following five arguments are often regarded as the most important (Schug (1988), Shapouri and Missiaen (1990), Srinivasan (1989), Hopkins (1987)):

- moral obligations in the presence of a food surplus in the developed countries and hunger and malnutrition in a wide part of the "third world,"
- encouragement of growth and economic development in developing countries,
- the use of food aid for surplus commodity disposal,
- development of new markets for agricultural products,
- support of foreign policy and military objectives.

There are distinct differences in objectives of food aid policies between the two most important donors of food aid, the US and the EC. This can easily be proved by their catalogues of objectives. The US catalogue of objectives includes egoistic and altruistic goals. The more altruistic ones are to combat hunger and malnutrition in developing countries and to encourage the economic development of developing countries. Further objectives, like surplus disposal of agricultural commodities, expansion of international trade and the promotion of US foreign policy are of a more egoistic nature (Beissner (1986)). The position of the EC, on the other hand, includes more altruistic objectives, like disaster relief, enhancement of the nutritional situation among the beneficiary population and contribution to a well-balanced economic and social development of the recipient countries (European Community (1982)). In 1986, the EC's catalogue of objectives was expanded. New objectives are the promotion of food security in the recipient countries and regions and the support of the recipient countries' efforts to improve their food production (European Community (1986)).

Another important difference between US and EC food aid is the grant element involved. While EC's food aid is totally on a grant basis, the US deliveries are distinguished under three titles. Title I includes food aid under long-term loans to be repaid in local currency. Title II provides food aid in case of emergency as a grant, and Title III allows private voluntary organizations to distribute food either domestically or to needy countries. If the recipient country meets specified development goals, the long-term loans mentioned in Title I can be changed since 1977 into a grant (Shapouri and Missiaen (1990)).

A study by Eggleston of the determinants of level and distribution of PL480 food aid shows that this kind of foreign aid is influenced by the recipient's needs, the recipient's ability to purchase on the world market, political and security concerns of the United States, and the political party holding office in the White House (Eggleston (1987)).

For the total EC food aid (Community plus member action), a recent study elaborates the following allocation criteria. The EC's food aid to a specific country is the higher:

- the lower the growth in food production,
- the lower the per-capita income of the recipient country,
- the higher the trade growth between the recipient country and the EC,
- the larger the EC's market share in the recipient country (Shapouri and Missiaen (1990)).

Within the EC's food aid policy, we must distinguish between Community action and bilateral aid by single member countries. While the Community has developed a comprehensive system of different aid possibilities, objectives and allocation criteria for Community food aid (Prinz (1990)), the bilateral food aid by individual member countries varies regarding financial pressure, institutional controls and policies (Shapouri and Missiaen (1990)). Therefore, only EC Community food aid will be investigated in the following section. Community food aid has become the major part of overall food aid by the EC. The ratio of EC Community action to total EC food aid deliveries rose from 30% in 1968 to 57% in 1988.

The EC started its first Community food aid programme within the framework of the Food Aid Convention with 300,000 mt of cereals in 1968, to which the Community had committed itself (Frisch (1989)). The deliveries in 1987/88 amounted to 1.8 million mt of cereals. The actual commitment in the Food Aid Convention was supposed to meet 1.67 million mt after 1986 (FAO (a)). There was increasing criticism of the EC's food aid at the end of the seventies because it was functioning more as an instrument of surplus disposal and emergency relief than as a development tool (Cathie (1982)). A reaction to the criticism of the EC's food aid policy formulation occurred in 1983, when objectives and allocation criteria were declared. In addition to this, the constitution of a committee for food aid was established which was supposed to lead to a faster provision of food aid deliveries than in the past (Prinz (1990)). With the last regulation in 1986, food aid was administered strictly according to considerations of development policy and was disengaged from agricultural policy (Frisch (1989)).

The allocation criteria for the EC's Community food aid are:

- fundamental food requirements,
- per-capita income,
- the balance-of-payments situation (European Community (1982))
- the economic and social effects, as well as the expense of the proposed measure (European Community (1986)).

These official criteria will now be tested first in a linear multiple regression model using cross-country data for the period 1983-1985. At a later stage, additional criteria will be introduced which capture the recipient country's dependence on food imports. The last mentioned criterion in the set of allocation criteria was introduced in 1986. As the period 1983-85 is studied here, it is sufficient to concentrate on the first three criteria in this model. The independent variables are lagged by two years, because we argue that the allocation decision of the EC-bureaucracy is likely to be based on the most recent data set available. Comparison with the cross-country data included in the Workd Bank "World Development Report" shows a time-lag for the relevant data of between two and three years. Therefore, the international allocation of food aid is modelled as follows in the basic equation:

$$(27) \qquad FA_i = f(NS_i,\ GNP_i,\ CAB_i).$$

FA is the amount of EC cereal food aid per capita committed to the recipient country i. NS indicates the fundamental food requirements in country i. This criterion is measured by the daily per-capita calorie supply as a percentage of the daily calorie requirements. GNP is the gross national product per capita and is used as a measure for the per-capita income in the recipient country i. CAB represents the current-account balance, and captures the balance-of-payments situation in country i. "The current-account balance is the difference between (1) exports of goods and services, plus inflows of unrequited official and private transfers, and (2) imports of goods and services, plus unrequited transfers to the rest of the world" (World Bank (1987), p. 301). The expected signs are:

$$\frac{\delta FA}{\delta NS} < 0; \quad \frac{\delta FA}{\delta GNP} < 0; \quad \frac{\delta FA}{\delta CAB} < 0$$

The number of countries receiving food aid was 28 in 1983, 44 in 1984, and 37 in 1985. The lack of data for NS and CAB regarding countries with a population of less than 1 million, reduces the number of

Table 4

THE IMPORTANCE OF OFFICIAL ALLOCATION CRITERIA AND FOOD IMPORTS FOR THE DISTRIBUTION OF THE EC'S CEREAL FOOD AID[a)]

	CONST	GNP_{t-2}	CAB_{t-2}	NS_{t-2}	$FOIND_{t-2}$	$CIMP_{t-2}$	SSR_{t-2}	F	$\bar{R}^2$
FA_{1983}	−3.2425	−0.0076	−0.0696	0.0591				4.07	0.42
	(−0.84)	(−3.17) *	(−3.39) **	(−1.40)					
	6.3123	−0.0067	−0.0666		−0.0433			2.89	0.30
	(0.33)	(−2.60) *	(−2.63) **		(−0.22)				
	1.6000	−0.0077	−0.0601			+ 0.0258		10.98	0.70
	(2.86) *	(−4.63) **	(−4.14) **			(3.62) **			
	9.4650	−0.0072	−0.0451				−0.0833	21.36	0.82
	(6.69) **	(−5.80) **	(−3.92) **				(−5.47) **		
FA_{1984}	6.3109	−0.0080	−0.0941	−0.0337				8.36	0.47
	(1.49)	(−3.05) **	(−4.99) **	(−0.73)					
	25.8943	−0.0070	−0.0849		−0.2320			14.63	0.62
	(3.52) **	(−3.15) **	(−5.27) **		(−3.09) **				
	3.0214	−0.0090	−0.0803			+ 0.0270		9.74	0.51
	(2.94) **	(−3.59) **	(−4.08) **			(1.59)			
	12.1805	−0.0080	−0.0645				−0.1016	14.69	0.62
	(4.07) **	(−3.69) **	(−3.52) **				(−3.10) **		

Table 4 (Continued)

	CONST	GNP_{t-2}	CAB_{t-2}	NS_{t-2}	$FOIND_{t-2}$	$CIMP_{t-2}$	SSR_{t-2}	F	$\bar{R}^2$
FA_{1985}	3.3417	−0.0043	−0.0536	−0.0091				3.13	0.23
	(0.82)	(−2.35) *	(−2.93) **	(−0.20)					
	5.8745	−0.0041	−0.0489		−0.0345			3.25	0.24
	(0.91)	(−2.25) *	(−2.45) *		(−0.52)				
	2.1020	−0.0055	−0.0350			+ 0.0358		9.19	0.54
	(2.89) **	(−3.86) **	(−2.33) *			(3.47) **			
	8.9939	−0.0047	−0.0340				0.0751	7.94	0.50
	(4.05) **	(−3.23) **	(−2.13) *				(−3.09) **		
$FA_{1983-85}$	3.3404	−0.0061	−0.0705	−0.0071				13.37	0.38
	(1.33)	(−4.67) **	(−6.25) **	(0.26)					
	11.9287	−0.0057	−0.656		−0.0947			15.91	0.42
	(2.75) **	(−4.58) **	(−5.92) **		(−2.14) *				
	2.3334	−0.0071	−0.0575			+ 0.0300		22.07	0.51
	(4.51) **	(−6.10) **	(−5.46) **			(3.94) **			
	10.0752	−0.0065	−0.0487				−0.0842	27.43	0.57
	(6.50) **	(−6.01) **	(−4.69) **				(−5.00) **		

a) List of abbreviations: FA = food aid; CONST = constant term; GNP = gross national product; CAB = current account balance; NS = nutritional situation; CIMP = cereal imports; FOIND = index of food production; SSR = self-sufficiency-ratio; $\bar{R}^2$ = corrected coefficient of determination; F = F-value. The values in parentheses are t-values. The levels of statistical significance of the estimated coefficients are indicated by * for 95% and ** for 99%. The number of countries amounts 14 for 1983 and 26 or 22 for 1984 and 1985 respectively. The pooled sample regression considered 62 observations.

Sources: FAO (b), FAO (c), FAO (d), World Bank, Commission of the EC (1986) and authors' computations.

observations to roughly a half.

Table 4 presents the econometric results on the determinants of the international allocation of the EC's food aid. The explanatory variables in the basic model only account for less than half the variation in EC's Community cereal food aid transfers in single-year equations and in the pooled-sample equation, However, estimations indicate that the official EC allocation criteria are important for explaining the distribution of food aid.

The coefficients for the income and balance-of-payments situation are negative and significant at least at the 95%-level. Furthermore, the results of the multiple regressions indicate that NS as an indicator of fundamental food requirements is not statistically significant. One interpretation of the insignificance is that this allocation criterion is not considered in the distribution process. Another possibility is that the EC uses other indicators to capture the food requirements of the developing countries. In order to test the latter hypothesis, three other indicators are introduced in turn into the model. Two of these additional variables are proxies for the import dependence of food which we are especially interested in.

$FOIND_i$ is the index of the food production per capita in country i, and the expected sign of the regression coefficient is negative. This variable is used as an indicator of the change in food requirements for the countries under consideration.

CIMP stands for the cereal imports per capita in country i. A priori, it is uncertain how food aid to a country is affected by the country's commercial cereal imports. If the estimation reveals a significant positive coefficient, it indicates that food aid is distributed more to countries which are able to import cereals commercially. A negative sign, however, indicates that the EC primarily tries to fill the cereal gap of food-import dependent countries with severe balance-of-payments constraints. Hence, both signs could be in line with the official allocation criterion, the fundamental food requirements.

SSR is the self-sufficiency ratio for cereals in country i and is computed as domestic cereal production divided by the sum of domestic cereal production and cereal imports. Stock fluctuations, which normally would be considered, are neglected due to an insufficient data base. Moreover, it is pulausible that in countries with food shortages stocks are rather low. Hence, the impact of stocks on the self-sufficiency ratio is quite small in those countries.

The self-sufficiency ratio, as another indicator of import requirements or fundamental food requirements, is expected to be negatively related to

food aid if the EC assists countries with high dependence on cereal imports. A positive sign would imply that countries with improved food production get higher food-aid shipments. Then the EC would reward recipient countries for a success in domestic-production terms and infringe against their postulated allocation criterion, the fundamental food requirements.

The empirical results on the basis of the modified models are as follows. FOIND has a significant influence on the EC's food aid allocation in the pooled sample as well as for the estimation of the single year 1984. Although all official EC allocation criteria now yield significant coefficients with the expected signs in both cases, the corrected coefficients of determination only range between 28% and 62%. This suggests problems of insufficient indicator selection, of missing explanatory variables, and/or of the existence of important allocation criteria besides the officially pronounced ones.

When the proxy for the fundamental food requirements is changed and the indicators capturing the food-trade positions are introduced, the model yields estimations with distinctly higher corrected coefficients of determination. The explained variance of the EC's Community food aid shipments then ranges between 50% and 82% in all investigated periods. These values of $\bar{R}^2$ are noteworthy given a cross-country analysis. Besides the strong impacts of GNP and CAB, the donations of food aid to a country are significantly negatively related to the country's self-sufficiency ratio in all equations and significantly positively influenced by cereal imports in all equations except in that for 1984. The regression coefficient indicates that a 1% increase in the self-sufficiency ratio leads to a reduction of EC food aid between 75 and 100 grams per capita. On the other hand, each additional kilogram of cereal imports per capita increases food aid by roughly 30 grams per capita. Both equations prove that the EC tends to put more emphasis on an actual situation of need than on a reward for the improvement of domestic production. The effect of an improved income and balance-of-payments situation is fairly stable across all four models. The estimated reaction potential to a 100 US$ change in GNP ranges between 400 and 900 grams of food aid per capita. The results for the balance-of-payments situation show a negative relationship between the current-account balance and food aid. Thus, a deterioration of the current-account balance by 10 US$ per capita raises the deliveries of EC food aid between 300 and 900 grams per capita.

The results of the regression analysis support the hypothesis that the allocation of the EC's food aid sticks to its official basis. Virtually all indicators yield significant coefficients in the regression analysis and are able

to explain a considerable part of food aid distribution in the period 1983-1985. Most difficult is the consideration of the fundamental food requirements due to the fact that no exact measure exists for this criterion. The different indicators which were tested indicate that the self-sufficiency ratio is the best proxy for this allocation criterion. The calorie supply, however, is not able to explain the distribution of the EC's Community food aid. It might be that FAO figures on calorie supply are unreliable (Prinz (1990)).

Summing up, the comparison of the four different allocation models for EC Community cereal food aid indicates that all official allocation criteria affected the distribution of food aid across developing countries in the period 1983-1985. This means that income and the balance-of-payments situation are important for the international allocation of food aid. The third postulated criterion, food requirements, could be proved to be important in the allocation process, too. This holds true when fundamental food requirements are measured by domestic food production, imports of cereals or the self-sufficiency ratio.

IV. Summary

In the economics of food aid, the linkages between food aid and food trade play a central role. Most contributions on this subject have anlayzed these linkages on the basis of case studies and qualitative judgements. It was the purpose of this paper to study the effects of food aid on food trade analytically as well as in a quantitative analysis. The major results are:

1. Within a theoretical model of a food staple in a developing country, we have elaborated how food aid affects food trade. The anlaysis revealed that domestic policy is crucial for the trade effects of food aid. When food aid is given in the form of bulk supply, the model shows that a full substitution of food trade by food aid in the recipient country is a special case. Food trade may fall, remain constant or even rise due to increased food aid. The important issue is whether the recipient country's government spends the counterpart funds for demand or supply subsidization.

2. We then tried to measure the impact of food aid on food imports. Import demand functions were estimated for Peru, Botswana, Egypt, Sudan and Morocco. Food imports were shown to be partly displaced by food aid. In most cases there was less than a one-to-one substitution. This lends support to the hypothesis that counterpart funds are

primarily used for demand subsidization.

3. When the donor rather than the recipient is considered, food aid is no longer an exogenous variable. We investigated which factors determine the internatinal allocation of aid in the case of the EC's Community food aid in cereals. A quantitative cross-country analysis suggests that food aid policy in the period 1983-85 was guided to a large extent by the postulated allocation criteria, income and the balance-of-payments situation. Moreover, the net trade position in food is important. The higher a country's import dependence on food the higher is the amount of food aid the country receives from the EC.

References

Abbott, P.C., "Modeling International Grain Trade with Government Controlled Markets, *American Journal of Agricultural Economics,*" 61, 1979, 24-31.

Askari, H. and J.T. Cummings, "Agricultural Supply Response," *A Survey of the Econometric Evidence,* New York, Washington, London, 1976.

Beisner, K-H., Nahrungsmittelhilfe—Ziele, Wirkungen, Evaluierungsmöglichkeiten. (Schriften des Zentrums für regionale Entwicklungsforschung der Justus-Liebig-Universität Giessen, Bd., 31), Hamburg, 1986.

Braun, J. von, "Wirkungen von Nahrungsmittelhilfe in Empfängerländern — Vergleichende Untersuchung für Ägypten und Bangladesh," *Quarterly Journal of International Agriculture,* 19, 4, 1980, 338-365.

Braun, J. von and B. Huddleston, Implications of Food Aid for Price Policy in Recipient Countries, In: Mellor, J.W. and R. Ahmed (eds.), Agricultural Price Policy for Developing Countries, Baltimore, Maryland, 1988, 253-263.

Byerlee, D. and G. Sain, "Food Pricing Policy in Developing Countries: Bias Against Agriculture or for Urban Consumes?," *American Journal of Agricultural Economics,* 68, 1986, 961-969.

Cathie, J., "The Political Economy of Food Aid, Aldershot," Hants, 1982.

Cathie,. J. and R. Herrmann, "The

Southern African Customs Union, Cereal price Policy in South Africa, and Food Scurity in Botswana," *The Journal of Development Studies,"* 24, 1988, 394-414.

Clay, E. and C. Benson, "Aid for Food. Acquisition of Commodities in Developing Countries for Food Aid in the 1980s," *Food Policy,* 15, 9, 1990, 27-43.

Commission of the EC, Nahrungsmittelhilfe der Europäischen Gemeinschaft, (Grünes Europa Nr. 216), Brüssel, 1986.

Dearden, P.J. and P.J. Ackroyd, "Reassessing the Role of Food Aid," *Food Policy,* 14, 3, 1989, 218-231.

Eggleston, R.C., "Determinants of the Level and Distribution of PL480 Food Aid: 1955-79," *World Development,* 15, 6, 1987, 797-808.

European Community, Verordnung (EWG) Nr. 3331/82 des Rates vom 3. Dezember 1982 über die Nahrungsmittelhilfepolitik und -verwaltung und zur Änderung der Verordnung (EWG) Nr. 2750/75. *Amtsblatt der Europäischen Gemeinschaften,* Nr. L352, 1982, 1-4.

_____Verordnung (EWG) Nr. 3973/86 des Rates vom 22. Dezember 1986 über die Nahrungsmittelhilfepolitik und -verwaltung, *Amtsblatt der Europäischen Gemeinschaften,* N. L370, 1986, 1-4.

FAO, *World Crop and Livestock Statistics, 1948-85,* Rome, 1987.

_____, (a) *Food Aid in Figures,* Rome, various years.

_____, (b) *Production Yearbook,* Rome, various years.

_____, (c) *The State of Food and Agriculture,* Rome, various years.

_____, (d) *Trade Yearbook,* Rome, various years.

Frisch, D., "EEC Food Aid: The Instrument of a Development Policy," *The Courier,* 118, 1989, 57-59.

Garnder, B.L., *The Economics of Agricultural Policy,* New York, 1987.

Hall, L.L., "Evaluating the Effects of PL480 Wheat Imports on Brazil's Grain Sector," *American Journal of Agricultural Economics,* 62, 1980, 19-28.

Henze, A., D. Augustin and B. Schneider, "Food Aid of the EC and the Federal Republic of Germany to Developing Countries," *Quarterly Journal of International Agriculture,* 21, 4, 1982, 303-316.

Herrmann, R., "The Differential Impact of Prices and Exchange Rates on Food Imports: An Econometric Analysis for Peru." (Discussion Papers in Agricultural Economics No. 1, Institute of Agricultural Policy and Market Research, University of Giessen), Giessen, 1990.

Hopkins, R.H., "Aid for Development: What Motivates the Donors," In: Clay, E. and J. Shaw (eds.), *Poverty, Development and Food,* Essas in honour of H.W.

Singer on his 75th birthday, Hong Kong, 1987, 153-172.

International Monetary Fund, *International Financial Statistics: Yearbook,* Washington, D.C., various years.

Isenman, P.J. and H.W. Singer, "Food Aid: Disincentive Effects and Their Policy Implications," *Economic Development and Cultural Change,* 25, 2, 1977, 205-237.

Jabara, C.L., "Wheat Import Demand Among Middle-Income Developing Countries: A Cross-sectional Analysis." (ERS Staff Report No. AGES 820212, International Economics Division, Economic Research Service, U.S.D.A.), Washington, D.C., 1982.

Lachmann, W., Wirtschaftstheoretische Überlegungen zu möglichen Wirkungen der Nahrungsmittelhilfe in Entwicklungsländern. In: Körner, H. (ed.), *Probleme der ländlichen Entwicklung in der Dritten Welt,* (Schriften des Vereins für Socialpolitik, Neue Folge Bd. 173), Berlin, 1988, 101-122.

Maxwell, S.J. and H.W. Singer, "Food Aid to Developing Countries: A Survey," *World Development,* 7, 1979, 225-247.

Mitchell, D.O., "Import Demand for Grains: Implications for U.S. Agricultural Policy." (Division Working Paper No, 1985-5, Commodity Studies and Projections Division, The World Bank), Washington, D.C. 1985.

Nelson, G.O., "Macroeconomic Dimensions of Food Aid," In: Nelson, G.O. et al. (eds.), *Food Aid and Development,* New York, 1981, 31-48.

Peterson, W., "International Supply Response," *Agricultural Economics,* 2, 1988, 365-374.

Prinz, C., "Rechtsgrundlagen und internationale Allokation der EG-Nahrungsmittelhilfe." (Discussion Papers in Agricultural Economics No. 3, Institute of Agricultural Policy and Market Research, University of Giessen), Giessen, 1990.

Sarris, A., "European Agriculture, International Markets and LDC Growth and Food Security." (Plenary Paper, Sixth European Congress of Agricultural Economists, *European Agriculture in Search of New Strategies,* The Hague, The Netherlands, 3-7 September), 1990.

Schug, W., "Nahrungsmittelhilfe für die Dritte Welt aus EG-Agrarüberschüssen." In: Finke, K. and J. Linscheid (eds.), Vorträge der 41. Hochschultagung der Landwirtschaftlichen Fakultät der Universität Bonn vom 23. Februar in Münster, Münster-Hiltrup, 1988, 21-32.

Shapouri, S. and M. Missiaen, "Food Aid: Motivation and Allocation Criteria." (Economic Reserach Service, Foreign Agricultural Economic Report No. 240, U.S.D.A.), Washington, D.C. 1990.

Srinivasan, T.N., "Food Aid: A Cause of Development Failure or an Instrument for Success," *World Bank Economic Review,* 3, 1, 1989, 39-65.

Wilde, L.C., Short-Run Demand Elasticity Estimates in International Grain Trade. In: Bellamy, M. and B. Greenshields (eds.), *Agriculture and Economic Instability.* (I.A.A.E. Occasional Paper No. 4), Aldershot, Hants, 1987, 284-288.

World Bank, *World Development Report,* Washington, D.C., various years.