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Agricultural Modernization in Market
and Planned Economies: The German Experience*

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Two separate German states have existed since World War II. They are the Federal Republic of Germany (West Germany), and the German Democratic Republic (East Germany).^{1/} Though with the same past, East Germany and West Germany now have different political and economic systems. West Germany has a parliamentary democracy, private ownership of the main means of production, and a market economy. East Germany is a socialist state with a planned economy. Socialization in the industrial sector proceeded gradually, resulting in public ownership of 80 percent of the means of production by 1969. In the agricultural sectors, farms were re-organized into cooperatives and state farms. By 1969, 93 percent of total agricultural land in East Germany was under some type of socialist ownership. These post war developments have led to totally different farm organization in the two present German states. Family farms predominate in West Germany, while comparatively large producer cooperatives have been the prevalent East German farm organization since 1960.

The organization of agriculture into big producing units has been a long-held socialist goal, first implemented in the Soviet Union. Under Soviet influence, East Germany adopted their large unit model of farm organization. But one fact differentiates East German and Soviet experiences. Germany was a highly industrialized country prior to collectivization, whereas the Soviet agricultural reorganization was imposed at an earlier stage of economic development. Consequently, the present division of Germany provides a unique opportunity to compare modernization of traditionally and collectively organized agriculture, in advanced economies which had a common background.

In this paper, views of large scale farm organization are traced from the 19th century to date. Then, the structures of East and West-German industry and agriculture are described. Next the productivity of East and West German agricultural land and

labor are compared for the period 1958-1969. The paper is concluded with general observations on the effects of collectivization. Implications are drawn for nations now evaluating alternative solutions to economic and social problems of agricultural development.

Large-Scale-Farms as an Organizational Goal in European Agriculture

Many influential social philosophers of the 19th century considered cooperative farming one solution to social problems resulting from industrialization. Examples may be seen in the writings of Robert Owen in England and Charles Fourier in France. Similarly Karl Marx and Friedrich Engels viewed cooperative farming as a remedy for a society shaken by industrialization. They were proponents of a radical transformation to a new society through the continued process of industrialization. Marx knew that the industrialization process required a continued outflow of workers from overpopulated rural areas. He concluded that such a shift of workers could occur only in the upswing of the business cycle [12, p. 671].

Marx and Engels asserted that the first step in agricultural development was to expropriate large private land holdings. It was reasoned that large farms could more easily adopt the new technology then available. For example, steam plows were used in England on large plots of land. But, except for several huge estates, continental farming was conducted on land holdings too small to utilize steam plows. Hence, in view of the agricultural organization and technological developments of his time, Engels proposed that all farmers be organized into large farm units in the future socialist society [7, p. 408].

The emphasis on large scale farm organization by Marx and Engels contrasted with their proposals for industry. They believed that optimum sized industrial firms would evolve through the force of the historical process. Extensive reorganization was not proposed.

At the end of the 19th century, questions arose regarding the specific economic organization of socialist states. Marx and Engels had not provided details. Karl Ballod addressed himself to these issues in 1898.^{2/} For agriculture he stressed the need to reorganize small German farms into big farms. At that time, there were 5.5 million small, medium, and large farms in Germany which engaged 27 percent of the labor force. He calculated that 36,000 farms, each with 500 hectares, employing 54 workers, could provide the nation with more and cheaper food. This plan would employ six to seven percent of the total German labor force. It was a revolutionary idea.

Interest in expanding farm sizes by deliberate steps is still alive. In 1968, the commissioner for agriculture of the European Commission at Brussels, S. L. Mansholt, made similar proposals [10]. He outlined a plan to create big farms in Western Europe to be completed by 1980. He argued that large farms would provide (1) higher incomes and (2) improved social conditions for the rural population. The cost estimates were criticized as too high, [27] and the plan was not implemented. D. Bergmann analyzed the costs and productivity effects of reorganizing French agriculture [27]. He estimated that farm numbers should be reduced from 1.875 million to less than 34 thousand farms from 1968 to 1985. This reduction would adjust French agricultural output to demand and raise farm incomes to equitable levels. Other European agricultural economists and journalists also have written about the positive economic effects of a bold approach to reorganize small farms into larger units.

Industry and Agriculture in Pre-War Germany

Agriculture was not the main occupation of the labor force in the German Reich even before World War II. On the territory now constituting East Germany (East Berlin included) 1.7 million workers, or 20.1 percent of the total labor force, worked in agriculture and forestry in 1939. Twenty-seven percent of the labor force were industrial workers. The remainder were engaged in tertiary sectors of the economy [18, (1966), p. 147].

On the present West Germany territory (West Berlin included) 5.4 million, or 25.1 percent of the total labor force, worked in agriculture in 1939. Employment in the industrial sector engaged only 23 percent of the total working population.^{3/}

The industrial composition differed between prewar East and West Germany. Heavy industry (coal, steel, some chemical and engineering firms) was concentrated in the West, centered in the Ruhr-Rhein-Main districts. The Saxon-Thuringian area of the present East Germany contained parts of the chemical, textile, and machinery industries. Despite these differences, the labor distribution by economic sector varied little. Consequently, per capita incomes were similar.^{4/} These comments indicate that prewar industrialization and economic levels were about equal in East and West Germany. The industrial structures differed but neither area was mainly agricultural nor backward, and both areas contained some largely agricultural sections.^{5/}

Arable land in prewar East Germany was 80 percent of the total agricultural area. The rest was permanent grassland. The percentage of arable land fell to 73.6 percent in 1969. West Germany had a higher share of permanent grassland. Only 59 percent of the total agricultural area

was arable land in prewar time. This percentage fell to 54.7 in 1969.

Prewar farm sizes also differed between East and West Germany. In West Germany only four percent of total agricultural land belonged to farms with more than 100 hectares. The corresponding percentage in East Germany was 28 percent. Farms between 20 and 100 hectares covered 34 percent and 31 percent of agricultural land, respectively, in West and East Germany. Inheritance customs contributed to land fragmentation in western and southern parts of West Germany. Moreover, a hilly landscape in these areas made mechanization of agriculture difficult. This contrasts with flat plains in most parts of East Germany.

Agricultural production before World War II reflected the differences in farm sizes as well as natural and economic conditions. According to K. Merkel, livestock production in West Germany accounted, during 1935/38, for 77 percent of total agricultural production compared with 65 percent in East Germany [13, p. 355]. The smaller farm size and higher percentage of permanent grassland forced farmers in West Germany to devote more labor to livestock production. Nevertheless, the value of total crop and livestock production per unit of agricultural land was about the same in East and West Germany, at 2.3 tons of grain units per hectare [13, p. 354].^{5/}

To sum up, it seems justified to conclude that prewar natural conditions, factor endowments and levels of agricultural productivity were similar for the two parts of present-day Germany. Differences certainly were smaller between the two parts of Germany than between any two other neighboring countries. Thus, the following comparison is based on relatively homogenous areas with similar production structures.

Post World War II DevelopmentsIndustrial Production

Walter Ulbricht, former chairman of the State Council and first secretary of the Party of Socialist Unity in Germany (SED), outlined in 1958 the East German main economic task, "ökonomische Hauptaufgabe". At the end of the 1950's, he stated that East Germany must . . . "develop the national economy such that our workers' per capita consumption of important food and consumer goods reaches and surpasses the per capita consumption of the whole population in West Germany" [15]. One decade later it became clear, even to East German leaders, that this goal was too ambitious.

In 1969 W. Ulbricht stated publicly that West German labor productivity exceeded East German by 20 percent [22]. Estimates made by an economist at an institute in West Berlin (Deutsches Institut für Wirtschaftsforschung) indicated a greater gap. According to his calculations, based on 200 industrial goods weighted with West and East German prices, East German industrial productivity in 1968 was more than 34 percent lower than West German. The difference in productivity for the entire population may not be as great since a higher percentage of the total East German labor force is engaged in industry [26]. These statements reveal that average income in East Germany is now lower than in West Germany. ✓

Reasons for the lower productivity in the East German industrial sector can be related to certain inefficiencies of planned economies. Socialist nations trade mostly by barter. Such trade arrangements provide little challenge to firms. The reliance on five year overall economic plans is likewise a deterrent, the allocation of resources and timing of investments for five year periods makes it difficult to introduce modern technology from other nations as it becomes available. Also, East

Germany's leading economic position among socialist countries is a factor. As the leader, there is a lack of competition from comparably industrialized countries. Together these factors inhibit rapid technological advances which are necessary to raise productivity. These conditions in the industrial sectors influence agricultural developments in East and West Germany.

Farm Organization

West Germany had 1.4 million farms larger than 0.5 hectares, in 1965. Only 35 percent of these farms provided the sole source of income for the farm operator (Table 1). Farmers with less than 10 hectares rely partially or solely on non-farm income. Between 1949 and 1969, 600,000 farms were dissolved. They were mostly small farms, under 10 hectares. Hence, the land area involved was not sizable. Land added to larger farms, from farms dissolved during the two decades, accounted for only 15 percent of total agricultural land in 1969. Consequently, average farm size increased from 7.0 to 9.6 hectares from 1949 to 1969.

Three types of farm organization exist in East Germany. They are state farms, agricultural and garden producer cooperatives and other minor holdings (Table 2). This classification is based on ownership, not on sources of income. Nominally, most land is under private ownership in East Germany. State farm land is owned by the state. State farms are legally independent enterprises, but managers cannot buy or rent additional land. East Germany had 527 state farms in 1969, averaging 672 hectares each. State farms occupy only 5.6 percent of total agricultural land and produce about 10 percent of total market output. The East German state farm sector is relatively small compared with other socialist countries [23, p. 23]. The state farms were formed from expropriated large farms of more than 100 hectares. Additional land, confiscated by 1945 agrarian reform laws, was distributed to agricultural workers, refugees from eastern provinces of the German Reich and very small farmers. In total more than one-third of the agricultural land of East Germany changed ownership in 1945.

The formation of Agricultural Producer Cooperatives (APC) between 1952 and 1960 resulted in another turnover of ownership. This phase involved 87 percent of all agricultural land. The APC land is tilled by farmers as a group. There are three types of APC. Types I and II are considered pre-stages for cooperative farming. In a type I APC, only arable land is used in common. In type II, machinery is brought into the APC also. Both types I and II are declining in number. In 1969 only 22 percent of agricultural land held by APC's was operated as types I and II. Type III now predominates. In this type, agricultural land, machinery and livestock, are owned by the cooperative. It resembles the Soviet collective farm. In 1969 there were 9,386 APC's of all types, averaging 361 hectares in size. This is much smaller than the size of collective farms in the Soviet Union which average 6,100 hectares.

It would be misleading to assert that the establishment of APC's was a spontaneous action of East German farmers. Rather it was the consequence of a government policy to adopt the Soviet model of agricultural organization. Collectivization was achieved by official indoctrination, disadvantageous delivery quotas and norms, personal threats, intimidations, and ruthlessness against farmers who would not follow the prescribed model. However, East German collectivization has not led to the same excesses against rich farmers (Kulaks) as was true in the Soviet Union. In anticipation of collectivization, probably two-thirds of the rich farmers left East Germany. The decline in agricultural production during farm reorganization was relatively small in East Germany and not as disastrous as in the USSR during the 1930's.

The impact of farm reorganization on changes in farm numbers and employed agricultural workers is summarized in Table 3. From 1949 to 1968 agricultural labor forces declined at approximately the same annual rates--3.5 and 3.6, respectively--in West and East Germany. During the same period, West German farm numbers decreased

slowly, 1.3 percent annually. In contrast, the yearly decrease in East Germany was 17.9 percent for 1950-68. This reflects the distinctive pattern formed by collectivization. But even after completion of collectivization (1960-68), the annual rate of decrease in farm numbers was five times greater in East Germany than in West Germany. Adjustment patterns which differ so markedly suggest that the economic effects on land and labor productivity and on investment behavior vary also.

Agricultural Productivity

After World War II, West German industrialization was more rapid than East German. From 1950 to 1969 the West German total labor force increased from 20.4 millions to 26.8 millions. In 1969, compared to 1950, more than 6.4 million, or 30 percent, more new jobs had been created in West Germany. Twelve millions of refugees and two million foreign workers had been integrated into the West German labor force. In East Germany, only 400,000, or 6 percent, more jobs existed in 1969 than in 1949. The labor force increased in East Germany in this period only from 7.3 millions to 7.7 millions.

Prewar agricultural employment differed between the East German and West German areas. During the 1935-38 period, West German agriculture was typified as peasant farming, employing 36.9 persons per 100 hectares of agricultural land. During the same period on the territory of the present East Germany, only 25.5 persons per 100 hectares of agricultural land were employed. The difference between East and West has diminished. In 1969, 18.1 persons were working per 100 hectares in West Germany and 16.3 in East Germany.^{8/}

The approximately equal rate of decline in agricultural labor forces in East and West Germany (Table 3), but more rapid expansion of non-agricultural employment in West Germany since World War II, result in differences in the agricultural shares

of total employment. Agricultural workers constituted 8.8 percent of the total work force in 1969 in West Germany but 13.2 percent in East Germany, reversing the prewar relationship.

Before World War II, East German productivity per agricultural worker was greater than West German. The respective figures are 8.9 and 6.1 tons of grain units (Table 4). The difference was due to use of more fertilizer and machinery and better farm practices on the larger East German farms (Table 5). In 1958 the productivity lead shifted. Since then, West Germany has led East Germany. Productivity gains occurred in both areas but East Germany suffered two years of decline. They occurred in 1961 and 1962, following total collectivization. In West Germany, where no radical structural reform was imposed, gains were continuous. In 1969 average productivity per agricultural worker was 31 percent higher in West Germany than in East Germany.^{9/}

Prewar productivity per hectare of land was about the same in East and West Germany. More use of fertilizer, pesticides, and mechanization increased productivity in both parts of postwar Germany, but more rapidly in West Germany. In 1969, West German productivity per hectare of land was 40 percent higher than East German.

The above differences between East and West Germany in land and labor productivity indicate that even small farms can successfully increase their productivity. What is needed is an available, abundant supply of industrial inputs, which can be obtained only from modernized industrial and marketing sectors. This analysis supports the conclusion that in the West German economy the changes in overall productivity were more important than the organizational change in the agricultural sector in East Germany for increasing agricultural productivity.

Financing Large Farm Reorganization

Literature which deals with collectivized Soviet agriculture stresses that agricultural investments have been too low to fully exploit large-farm economies of scale. If this were due to the relatively low level of economic development in the USSR, it should be easier for a more advanced country, such as East Germany, to supply the needed investment. The methods of financing East German agricultural investments are explored in this section. Comparisons with West Germany provide a bench mark.

East German prices were increased to partially finance farm reorganization, (Table 6). Assuming a one-to-one exchange rate, livestock prices in East Germany exceeded those in West Germany for most products in all years shown. East German animal product prices were raised to increase the investment capacity of agriculture. East German prices in 1968 exceeded West German prices by the following percentages:

	<u>Percent</u>
hogs	85
cattle	43
poultry	174
milk	47
eggs	94
wool	915

East German prices for the main crops (rye, sugarbeets, oilseeds) have been only a little higher than West German. Likewise prices for agricultural inputs (fertilizers, feeding stuffs, etc.) have been nearly the same. But East German wages for agricultural workers are 20 to 25 percent lower than West German. Machinery prices during the 1960's have been only slightly higher in East Germany than in West Germany [24].

East German consumer food prices have been absolutely stable during the 1960's. The difference between the increased producer prices and stable consumer prices is subsidized by the government. The East German consumer, therefore, is not aware of the financial burdens from collectivization for the whole economy.

The total amount of subsidies for East German agriculture since World War II cannot be derived directly from official statistics but some annual data are available. In the 1963 state budget, the total subsidy for agriculture was indicated as 7,670 billion marks, or more than 1200 marks per hectare [8]. A general statement was made by an economist of the East German School for Planned Economics in Berlin-Karlshorst. He wrote in a 1967 issue of Public Finance that collectivization imposed a high financial requirement on the whole economy [11]. He gave no figures but cited the support of East German agricultural prices as the main item.

In 1968 the East German leader Walter Ulbricht also expressed concern with agricultural costs. He noted that collectivization put a heavy financial burden on the state budget [21]. Such a burden reduces the capacity of the East German economy to invest in more expanding industries. Obviously this effect had not been anticipated.

Table 7 shows the value of agricultural production for East Germany at West and East German farm prices, in total, and per hectare. These data indicate the large amount of indirect financial support for East German agriculture caused by high agricultural prices. The relatively high prices increased revenues, which provided incentives to raise agricultural production. East German economist Knauth argued that technological progress in East German agriculture would have been less and the positive effects of collectivization on production efficiency

delayed without these high price levels [11, p. 135]. Moreover, high prices were necessary to equalize the effects of relatively low land and labor productivity in order to provide equitable incomes for the agricultural population.

The 200 mark difference in agricultural income per hectare between 1955 and 1960 (column 4, Table 7) for East and West Germany is not unusual, but the increases since 1960, caused by higher producer prices, are exception.

On the other hand, it could be argued that the lower West German price levels do not reflect the many subsidy programs available for certain farms and specific purposes. Some costs of these programs are indeed the price of maintaining private ownership and small farms. However, total federal and state (Länder) subsidies for structural policy (land consolidation, enlargement of small farms, land improvement and agricultural roads) have been small in comparison with East German costs. For 1967 subsidies amounted to 83 DM per hectare [25, p. 53]. This may be compared with costs per hectare due to higher East German prices, assuming that large farms, such as those in East Germany, would eliminate the West German subsidies. The additional East German income, through higher prices, exceeded the cost of West German structural programs by more than 750 marks per hectare of agricultural land for the same year. The social cost of West German private ownership, which appears as the cost of structural programs, therefore, do not outweigh the effect of higher agricultural prices or of additional agriculture income in East Germany.^{10/} The persistent increased expenditure, through higher agricultural prices in East Germany, must be paid by the whole society. It can be regarded as the price to finance the transition from small-unit to large-scale farming.

Agricultural Investment

Total investment during the period 1960 to 1969 was higher in West Germany than in East Germany per capita and per employed person, (Tables 8 and 9, columns

2 and 3). From 1960 to 1968 West German agricultural investment declined from 5.3 to 3.6 percent of total investment. The level of agricultural investment has been constant while total investment has grown. The concurrent decrease in the number of agricultural workers resulted in an increased investment per worker of 30 percent during the 1960's. This increase, however, was less than the 38 percent increase in investment per worker for all sectors of the economy. In 1968 the investment per worker for agriculture was only 38 percent as large as the average investment for all employed persons. Hence, the increased saving and investment capacity of the growing West German economy is absorbed by the expanding industrial sector.

The investment patterns in East Germany were totally different. As a consequence of collectivization, agriculture's share in total investment rose from 1960 to 1969 from 11.8 to 15.1 percent, (Table 9, column 5). East German investment per agricultural worker in 1960 (before the final program of cooperative farm creation) was 70 percent of the average investment for all employed persons. The comparable figure in West Germany was 38 percent in the same year. The subsequent creation of large farms in East Germany required additional huge investments. Requirements were so large that in 1969 the investment for an agricultural worker exceeded per worker investment for the total economy by 534 marks or 13 percent.

The structure of agricultural investment likewise was affected by the creation of large farms in East Germany. Fifty-eight percent of all agricultural investments now go for farm buildings. In West Germany the corresponding percentage is only 27 percent. Housing for cooperatively owned livestock has absorbed most of the East German investment in farm buildings. Without this housing, planned improvements in livestock production would be hampered. From 1960 to 1968, new housing has been provided for 47 percent of all cattle and 40 percent of all pigs on state and cooperative farms. All cooperatively owned livestock are expected to be in new housing by 1980, assuming the planned level of investment can be maintained.

This intensive farm building program has severely restricted the capacity of the East German construction industry [6, p. 207]. To alleviate pressures on the construction industry, "building brigades" of former farm workers have been established in the APC's. Building costs are relatively high. East German costs exceed West German building costs per milk cow or per hog by 30 to 50 percent [25, p. 75].

Another effect of the rapid building program for livestock housing has been to curtail investment in agricultural machinery and other labor saving equipment, (Table 5). The comparative slowness of East German mechanization suggests that more investment is needed in tractors, combines, and other labor saving equipment. Otherwise, East German agriculture cannot keep pace with increases in West German productivity. Labor saving technology, compatible with large-scale farming, cannot be financed until investments in livestock housing are similar to present West German levels.

Conclusions

The effects of the investment required to create large farms are not limited to the agricultural sector. The data presented show that the East German economy has been impeded by the investment needs of a collectivized agriculture. Moreover, the present high East German agricultural investment level cannot be substantially lowered, if (1) the agricultural labor force is to be reduced at a rate comparable with West Germany, and (2) the socialist goal of large farms is pursued. The comparisons made in this paper reveal that East Germany has not kept pace with the continuously increasing agricultural productivity of the still mainly peasant farm agriculture of West Germany.

Nations which create big farms according to a timetable must pay the price of high agricultural investment levels for several decades. Countries with a relatively

small industrial base do not have the investment capacity to modernize agriculture. The establishment of large farms requires heavy investments which can be obtained only from other, more productive branches of the economy. To reach this goal in two decades can only bring a pyrrhic victory for the East German economy. Investments in more expanding sectors would yield greater social benefits, even in a socialist country, and greater contributions to long-term economic growth.

Implications

Nations exploring alternative paths to agricultural development can gain from the German experience. Some problems and consequences of the two diverse German approaches are presented and evaluated in this final section.

Agricultural Adjustment in a Market Economy

The type, size and structure of farm organization in a market economy result from a variety of economic and social forces. The market forces, the overall institutional framework, and the society's goals and values influence the decisions of the decentralized, independent producers. Not all farmers are earning sufficient income comparable to other sectors of the economy. In industrialized western countries farm numbers have declined at a rate of one to two percent per year from 1950 to 1960 [16]. Most dissolved farms had a small output, thus the annual economic impact on total farm organization and production is tolerable. Economic life on the remaining farms is continued by many marginal adjustments. For instance, farmers frequently change their input mix of land, labor and capital to reduce costs and expand output.

One advantage of this decentralized decision-making system is that each economic unit acts according to its specific environment and determines its own economic lifetime. Adjustments to changes in space and time are exceedingly accurate. This

exactness has capital-saving consequences. Capital necessary to finance chemical, biological and mechanical innovations flows into agriculture, as credit. Credit is not available to farms with a limited economic life expectancy. Thus, only viable farms receive new capital.

All economic and social outcomes of a decentralized agriculture decision-making system are not favorable. Some unfavorable consequences are: unsold surpluses on regulated markets, few social security benefits for farmers, and occupational immobility due to inadequate economic and social opportunities. Increasing social support of the farm sector is a price which market economies must pay for the efficient adjustment process.

Farm Enlargement Through Organizational Innovation in a Planned Economy^{11/}

The establishment of large-scale farms in a limited period of time requires adjustment programs to replace the daily marginal adjustment process of thousands and thousands of farms. Historically, programs used in socialist countries have been crude. In no country was there a detailed master plan or a reliable organizational theory behind the intended organizational innovation. The need to restructure East German APC's within nine years of their formation reflects such inadequacies.

The new large farm organization makes it difficult to determine the economic viability of each unit. Moreover, incomes of farmers must be protected during the reorganization. In East Germany, the government raised agricultural prices to guarantee farm incomes.

The selective mechanism of providing capital for the farm sector mainly by credit can only gradually be re-established. This can be done more easily when the adjustment rate in farm numbers reaches a tolerable rate for the banking system. The rapid adjustment claims a relatively higher proportion of the economy's capital-formation capacity in order to provide required agricultural investments. Capital

saving effects, flowing from large scale farming, do not occur immediately. The establishment of large farms also introduces labor-management problems. Formerly independent farmers now must work together. In East Germany, approximately 100 persons were involved in the formation of each new farm unit. These large operations require detailed management information systems which create new needs, internal and external, to the farm.

The internal aspects of bringing the right quality and quantity of decision making information to managers is not an easily solved task. Managing a newly created cooperative farm is more difficult than administering a state farm, since state farms previously were operated as large-scale, privately-held estates. But even there, 20% of the total labor force in state farms had administrative functions in 1968 [28 (1969), p. 179]. Traditional bookkeeping and information systems of the small farms are inappropriate for the new cooperatives. On a family farm, the financial status in assets, liabilities and liquidity can be maintained with simple control methods. Furthermore, farm units of 100 persons require job specialization, accurate registration of the working days and the promised awards. The recording system must also provide and account for the distribution of feeding stuffs for personally-held livestock. These internally created information requirements are enormously increasing the administrative personnel required in all APC's.

External information requirements relate to regional and local planning authorities. Future production and investment plans and projects must be developed and performance reported. The additional costs incurred for the required record and reporting system may outweigh expected gains from higher labor productivity on large farms.

A comparison of the number of workers in the lowest and highest size groups of APC's reveals a surprising low scale effect in reducing the labor force in larger

farms. For instance, the number of workers per 100 hectares of agricultural land dropped only from 17.3 in APC's below 200 hectares to 14.0 in APC's with more than 2,000 hectares [28, (1968), p. 179]. Immler [9, p. 100] shows that all West German farms have on a full-time basis an average of 13.2 agricultural workers per 100 hectares of agricultural land. This is one worker less per 100 hectares than the large APC's in East Germany. But West German farms with more than 100 hectares have only 5.5 agricultural workers per 100 hectare. This indicates how far away East Germany APC's and State Farms are from an economically based number of farm workers.

Another facet is technological advance. New technology was introduced more slowly in East Germany than in West Germany during the postwar period. For example, there was an 8 to 10 year time lag for the East German introduction of new hybrids for broiler and egg production. Hence, a large farm structure does not automatically assure rapid technological advance. If the new technology implies specialization, new farms which are simply enlargements of a former diversified small farm structure will rapidly become obsolete.

General Evaluation

After nine years of collectivization in East Germany, land and labor productivity lag behind the performance of relatively small West German farms. Potential economies of scale, expected from the East German large farm organization, cannot be measured yet. However, there are no indications that achievements will outpace those flowing from the continually adjusting farm sector of the West German market economy.

A design of large farms for a whole country appears superficially as a rational plan. But in reality the process has been fraught with difficulties. The necessity to plan comprehensively the entire farm sector is an insurmountable task. The

complexities are discussed in a recent article by Brzeski [3, p. 157]. He wrote "Not only do the decision makers lack the required information about organizational variants--their productivity, breaking-in characteristics, decay and change-over cost--but the acquisition of such data is virtually impossible." As a result, large farms have been established by trial and error.

A policy to restructure agriculture rapidly through measures such as collectivization implies that agriculture differs essentially from other sectors of an economy. It assumes that at some point in time the existent farm structure is ripe for total reorganization in contrast with other industries which progress by gradual change.

This paper reveals that even in an industrially advanced socialist country, such as East Germany, the economic effects of creating large farms are not as favorable as might be expected. It seems apparent, therefore, that there is not economic or social advantage for a nation of comparable industrial development in following this agricultural model. Moreover, countries with a smaller industrial base and less experience in planning would most likely achieve less success than East Germany.

FOOTNOTES

- 1/ The terms "East Germany" and "West Germany" are used in this paper to designate these two states. German boundaries prior to World War II also included territories now governed by the Soviet Union and Poland. The term "German Reich" connotes prewar Germany.
- 2/ Ballod, Karl, Der Zukunftsstaat, Berlin 1898. The "Zukunftsstaat" has been published under the pseudonym "Atlanticus" upon the suggestion of Karl Kautsky by the Karl Dietz-Verlag. [1] The first edition was 300 copies. The second edition appeared 1919 with 12,000 copies and was out of print in March 1920. The third edition had 5,000 (books) and 1928 appeared the fourth edition by the publisher E. Laubsche, Berlin. From the first edition six to eight translations have been made in Russian language (according to Karl Ballod, fourth edition, preface). One was authorized by Karl Ballod who was born in Russia and studied at Russian universities. From the second edition one translation has been made in Moscow, the other in Kharkov. Ballod's thoughts have had probably strong influence on the conception to create big farms in the Soviet-Union. Lenin has mentioned Ballod and considered the work of Ballod as one of the scientists who were the forerunners of state planning. He added "In the capitalistic society of Germany his plan was hanging in the air, a merely literaric product, the work of an individual. We have given a state order, we have organized hundreds of specialists..." (My translation - A. W.) See W. I. Lenin, Über den Wirtschaftsplan. (Lenin Werke, 32.) Dietz-Verlag. Berlin (East) 1961, p. 136. Lenin was in his writings well informed about the technical and economic discussion in German and American agricultural journals. The collectivization is today referred mostly to Stalin. I am not so sure whether Lenin not has lead more the way in his writings. The belief in the technical superiority of big farms was shared by many agricultural experts in Germany at the end of the 19th century. They took the observed productivity difference between big and small farms as given and underestimated the possibility of transfer of technical knowledge to small farms.
- 3/ The most intensely agricultural provinces of the German Reich, Silesia, Pomerania, parts of East Brandenburg, and East Prussia, are now parts of Russia and Poland and, therefore, not included in the comparison between present-day East and West Germany.
- 4/ Really comparable prewar per capita income figures are not available for the present West and East German states. For a well documented disucssion in English, of the structure of the East German economy, for the prewar years and from 1950 to 1958, see the works of Stolper [19].

- 5/ East Germany consists today of 14 administrative regions (Bezirke). Seven of them are West of the Elbe River (Magdeburg, Halle, Gera, Erfurt, Suhl, Leipzig, Chemnitz). In 1969 these seven regions contained 54.8 percent of the total population, 52.7 percent of the industrial labor force, and 44.2 percent of total agricultural land. This is not the same as the section formerly identified as Ostelbien. Prior to World War II, the most advanced agriculture of the German Reich was in the regions of Magdeburg, Halle, Leipzig, and Erfurt. In West Germany only agriculture in the Rhine-province had a comparable state of advanced development. The northern and eastern parts of present East Germany, with the exception of the Dresden and Berlin regions, were less advanced.
- 6/ Agricultural output of all products is converted to grain units to permit comparisons among commodities and between countries. This conversion also facilitates aggregation. It is used as a value measure, similar to the use of constant prices.
- 7/ However, The East German economy is the most advanced of all socialist countries. According to Soviet authors, the average consumer income is 50 percent higher in East Germany than in the Soviet Union [5].
- 8/ Agricultural labor force statistics in both parts of Germany must be viewed as approximations due to differences in concepts and definitions. The data reported here are official labor statistics. They over-estimate the labor input in West Germany, since farm wives and other persons are counted, regardless of the amount of their farm work. In East Germany only permanent workers are counted in the labor statistics. An alternative West German estimate indicates that 11.8 fully occupied persons per 100 hectares of agricultural land were employed in 1969-70, instead of the 18.1 figure reported above. But even using the more conservative official statistics, the West German relative decline in workers per unit of land is apparent.
- 9/ These calculations are based on the total number of agricultural workers in West Germany. K. Merkel has converted West German figures for agricultural productivity based on the number of full-time workers. His estimates reveal that in 1969, 38 tons of grain units were produced per full-time agricultural worker in West Germany. This is 70 percent higher than the corresponding East German figure [13].

- 10/ This comparison on the basis of agricultural prices is only partial. Excluded in both parts of Germany are transfer payments to integrate farmers into the social security systems (retirement payments, health insurance, etc.). Also excluded in both parts are costs of marketing regulations; transportation and storage of agricultural products. Such figures are not readily available for East Germany. The different methods of national accounting between planned and market economies pose additional difficulties. However, it is unlikely that these limitations materially affect the analysis.
- 11/ The term organizational innovation is used in western literature to describe marginal adjustment of farms to the stream of biological, chemical and mechanical innovations. Collectivization is an abrupt organizational innovation. In this discussion, organization innovation refers only to the latter type, such as the total reform of formerly small farms in a centrally planned economy of the Soviet type. This type of innovation is a socialist approach to modernize agriculture.

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Table 1 - Distribution of Agricultural Land by Farm Type and Share of Market Production
West Germany
 1965

Farm Type	Number of Farms ^{a/}		Agricultural Land ^{b/}		Average Size of Farm Hectares	Estimated Share of Market Production 1963 ^{c/} Percent
	Million	Percent	Million Hectares	Percent		
1. Farms with only farm income (Vollerwerbsbetriebe)	0.5	35	9.4	72	18.8	67
2. Farms with additional non-farm income (Zuerwerbsbetriebe)	0.3	22	2.1	16	7.0	20
3. Farms with mainly non-farm income (Nebenerwerbsbetriebe)	0.6	43	1.5	12	2.5	13
TOTAL	1.4	100	13.0	100	9.3	100

a/ With more than 0.5 hectare.

b/ Arable land, gardens, meadows, and pastures.

c/ Estimated by Scholz.

Source: [17, p. 11].

Table 2 - Distribution of Agricultural Land by Farm Type and Share of Market Production
East Germany
 1969

Farm Type	Number of Farms ^{b/}	Million Hectares	Agricultural Land ^{a/} Percent	Average Size per Type of Farm Hectares	Percentage of	
					Estimated Market Production (Estimation) ^{c/}	Net Material Product
State Farms	527	0.354	5.6	672	10	13.6
Agricultural Producers Cooperatives (APC)	9,836	5.472	86.8	361	69	81.6
Garden Producers Cooperatives (GPC)	351	0.019	0.3	54	1	
Other Farms and Private Holdings	d/	0.456	7.2	d/	20	4.8
TOTAL		6.302	100		100	100.1

a/ Arable land, gardens, meadows and pastures.

b/ With more than one hectare.

c/ Estimation by the author on the basis that in 1969 approximately 30% of all livestock was held personally by farmers, agricultural and industrial workers outside the socialized sector of State Farms and Agricultural Producers Cooperatives.

d/ Included are private gardeners, tree-nurseries, church properties, etc., (11,766 in 1967). In addition to these non-socialized farms there are some households of industrial workers and other persons who have small strips of land, fruit and vegetable gardens. The total number of these households has not been published in recent years.

Source: [20, p. 155; 29, p. 70]

Table 3 - Number and Annual Rate of Decrease of Farms and
Agricultural Workers
Germany
1949, 1960 and 1968

Year	West Germany		Year	East Germany	
	Farms ^{a/} (in 1000)	Persons		Farms ^{b/} (in 1000)	Persons
1949	1,940	5,020 ^{c/}	1950	882	2,005
1960	1,618	3,623	1960	60	1,305
1968	1,377	2,630	1968	26	1,068

Annual Rate of Decrease ^{d/}					
1949-1960	1.6	3.2 ^{e/}	1950-1960	23.6	4.2
1960-1968	2.0	3.9	1960-1968	10.0	2.5
1949-1968	1.8	3.5 ^{f/}	1950-1968	17.9	3.6

a/ Farms with more than 0.5 hectares agricultural land.

b/ State Farms, Agricultural and Garden Producers Cooperatives, and other farms with more than one hectare.

c/ 1950.

d/ Compound rate.

e/ 1950-1960.

f/ 1950-1968.

Source: [25, p. 27]

Table 4 - Development of Total Agricultural Production and Productivity per Agricultural Worker^{a/} and per Hectare Agricultural Land in West and East Germany, Prewar and 1958-1969.

Year	Agricultural Workers 1000		Agricultural Land Million Hectares		Total Agricultural Production Million Tons GUB ^{b/}		Productivity in Tons GUB ^{b/}			
	West	East	West	East	West	East	Per Agricultural Worker		Per Hectare Agricultural Land	
	West	East	West	East	West	East	West	East	West	East
1935/38	5,400 ^{c/}	1,710 ^{c/}	14.612	6.711	32.9	15.3	6.1	8.9	2.3	2.3
1958	3,978	1,507	14.240	6.445	45.5	16.6	11.4	11.0	3.2	2.6
1959	3,820	1,430	14.210	6.427	45.3	16.1	11.9	11.3	3.2	2.5
1960	3,623	1,304	14.188	6.419	49.7	17.1	13.6	13.1	3.5	2.7
1961	3,445	1,278	14.160	6.415	48.0	15.7	13.9	12.4	3.4	2.4
1962	3,383	1,280	14.140	6.391	49.0	14.6	14.8	11.4	3.5	2.3
1963	3,230	1,255	14.120	6.369	52.7	14.4	16.3	13.1	3.7	2.3
1964	3,084	1,202	14.100	6.369	53.6	16.3	17.4	13.9	3.8	2.6
1965	2,966	1,179	14.071	6.358	51.5	18.0	17.4	15.3	3.7	2.6
1966	2,877	1,147	14.029	6.340	54.9	18.9	19.1	17.0	3.9	3.0
1967	2,742	1,124	13.996	6.327	58.6	19.6	21.4	17.4	4.2	3.1
1968	2,630	1,068	13.871	6.313	59.8	20.1	22.7	18.8	4.3	3.2
1969 ^{d/}	2,500	1,026	13.848	6.302	60.8	19.3	24.4	18.5	4.4	3.1

a/ Includes labor force working in forestry and fishery, about nine percent for West and East Germany in 1968.

b/ GU = Grain Unit. The final agricultural production (without seed, feed, waste, etc.) has been converted into grain units according to established conversion factors. These conversion factors convert dissimilar units to a common basis, similar to the use of constant prices.

c/ 1939.

d/ Preliminary.

Source: [13; 14; 18 (1966), p. 14].

Table 5 - Fertilizer Consumption and Mechanization, Germany, Prewar, 1960 and 1968.

Year	Fertilizer kg per ha Agricultural Land						Mechanization			
	West Germany			East Germany			Tractors in Horsepower per 100 ha Agricultural Land		Combines per 1000 ha Sown Grain Area	
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	West Germany	East Germany	West Germany	East Germany
1938/39	23.6	28.3	43.4	32.3	27.3	48.7	3.4	5.4	.	.
1960	42.1	45.5	71.1	38.5	35.1	82.3	119	39	5 _a /	4
1968	68.4	58.8	76.7	70.5	59.0	93.8	227	105 _b /	30	13 _b /

a/ 1958.

b/ 1969.

Source: [4 (1970), p. 62, 316, 318, 320; 13, p. 355; 28 (1970), p. 196; 29, p. 196].

Table 6 - Average Prices Received by East and West German Farmers per 100 Kilograms, in Local Currency, 1955, 1960, 1965, 1968.^{a/}

Product	West Germany				East Germany			
	1955/56	1960/61	1965/66	1968/69	1955	1960	1965 ^{b/}	1968 ^{b/}
Wheat	41.4	40.7	42.2	39.1	23.4	30.7	37.3	37.2
Rye	39.0	36.2	38.6	36.4	21.2	34.4	42.2	42.2
Potatoes	14.4	12.1	19.5	13.3	6.4	9.6	16.9 ^{c/}	17.1 ^{c/}
Sugarbeets	6.6	7.2	7.6	6.5	4.2	6.5	8.0	8.0
Oilseeds	75.7	66.0	66.0	74.4	116.0	101.9	106.6	107.3
Hogs	228.0	240.8	272.3	250.1	397.9	341.5	453.9	463.6
Cattle	171.3	200.4	243.5	251.5	139.8	281.8	312.2	360.6
Poultry	260.0	239.0	234.4	198.0	300.6	500.0	503.1	542.2
Milk	29.5	33.8	40.5	40.4	47.3	51.8	59.4	63.7
Eggs	354.3	325.8	332.3	303.0	445.4 ^{d/}	532.7 ^{d/}	569.0 ^{d/}	587.1
Wool	390.0	318.0	310.0	249.4	1,116.0	1,681.9	2,024	2,283 ^{e/}

^{a/} An exchange rate of 1:1 between the East and West German Marks is the practice for all intra-German trade. Despite the fact that the East German Mark is not convertible, this rate is assumed in our calculations. The exchange rate for one U. S. dollar was approximately four German Marks during this period.

^{b/} Without premiums for above quota production, introduced in 1964.

^{c/} Potatoes for seed included.

^{d/} Original prices quoted per 100 eggs. Converted to weight, assuming 100 eggs = 5.5 kg.

^{e/} 1967.

Source: [18; 28; different issues].

Table 7 - Total and per Hectare Value of East German Agricultural Production Valued at East and West German Farm Prices, 1955 to 1968.

Year	Value of Agricultural Production ^{a/}		Additional Gross Income in East Germany (with respect to West German farm prices)	
	East German ^{b/} Prices Million Marks	West German ^{c/} Prices Million DM	Total ^{d/} Million Marks	Per Hectare Marks
	1	2	3	4
1955	5,771	4,680	1,091	169
1956	5,465	4,595	870	79
1957	6,451	5,150	1,301	201
1958	7,027	5,553	1,474	228
1959	7,094	5,756	1,339	208
1960	8,197	6,021	2,176	338
1961	8,238	6,094	2,144	334
1962	7,772	5,844	1,928	301
1963	9,746	6,540	2,606	408
1964	10,688	7,295	3,393	531
1965	11,915	8,381	3,534	554
1966	12,653	8,444	4,209	661
1967	13,376	8,734	5,242	825
1968	14,228	8,838	5,390	850

^{a/} Quantities sold (staatliches Aufkommen) of the following agricultural products: wheat, rye, oilseed, potatoes, sugarbeets, cattle, calves, pigs, sheep, poultry meat, milk, eggs, and wool.

^{b/} East German quantities sold multiplied with average East German farm prices in Marks.

^{c/} East German quantities sold multiplied with average West German farm prices in Deutsch Marks (DM).

^{d/} Column 1 minus Column 2.

Source: [25, p. 38].

Table 8 - Investment for the National Economy and for Agriculture - West Germany 1960 - 1969, (Constant Prices from 1967)^{a/}.

Year	National Economy			Agriculture					
	Total National Investment	Per Capita	Per Employed Person	Total Agricultural Investment ^{b/}	Percentage of National Investment	Per Agricultural Worker	Total Agricultural Investment ^{c/}	Farm Buildings ^{d/}	Machinery
	Billion DM	DM		Billion DM	%	DM	DM per hectare agricultural land		
1960	89.15	1,608	3,397	4.75	5.3	1,312	333	79	228
1961	97.96	1,744	3,684	4.49	4.6	1,304	316	82	204
1962	103.39	1,816	3,860	4.03	3.9	1,190	284	80	182
1963	105.83	1,831	3,937	4.83	4.6	1,494	341	89	193
1964	118.34	2,031	4,386	5.12	4.3	1,661	363	92	211
1965	123.85	2,099	4,561	5.14	4.2	1,733	365	91	219
1966	124.94	2,095	4,613	4.30	3.4	1,494	306	89	160
1967	114.43	1,911	4,352	4.08	3.6	1,488	291	90	152
1968	123.42	2,051	4,685	4.48	3.6	1,702	333	92	176
1969 ^{e/}	139.80	2,300	5,216						

a/ Nominal prices divided by the index for investments in the national accounts.

b/ Investments made by farmers. Excludes state expenditures for land reclamation, land improvements, land consolidation, structural subsidies, etc. The total amount of state expenditures for structural policy - without costs of market intervention, credit subsidies etc., in 1967 was 1.167 billions of DM or 83 DM per ha.

c/ Total agricultural investment includes some minor items such as variation in livestock number, land improvement, etc.

d/ Excluding residential construction of farm houses.

e/ Preliminary, agricultural data not available.

Source: [25, p. 66].

Table 9 - Investment for the National Economy and for Agriculture. East Germany 1960-1969 (constant prices from 1967). ^{a/}

Year	National Economy			Agriculture					
	Total National Investment	Per Capita	Per Employed Person	Total Agricultural Investment	Percentage of National Investment	Per Agricultural Worker	Total Agricultural Investment	Farm Buildings ^{c/}	Machinery and Other Equipment
	Billion Marks	Marks	Marks	Billion Marks	%	Marks	Marks per hectare agricultural land		
1960	16,096	934	2,094	1,899	11.8	1,456	295	178	104
1961	16,310	952	2,120	2,153	13.2	1,685	335	173	147
1962	16,706	977	2,175	2,088	12.5	1,631	326	168	141
1963	17,091	996	2,235	2,359	13.8	1,880	369	200	149
1964	18,745	1,104	2,448	2,324	12.4	1,933	364	177	156
1965	20,489	1,204	2,669	2,725	13.3	2,311	428	224	178
1966	21,984	1,289	2,861	3,078	14.0	2,684	484	258	210
1967	24,005	1,405	3,112	3,312	13.8	2,947	522	307	195
1968	26,470	1,549	3,432	3,866	14.6	3,620	613	367	221
1969 ^{d/}	30,418	1,781	3,950	4,601	15.1	4,484	730	430	267

a/ Gross investment without general repairs.

b/ Investments for forestry are included (estimated about 1-2% of all agricultural investments). The investments for new drainage and irrigation systems, expanded land reclamation and land improvement programs are not included in this figure. A direct comparison can be made with West German total agricultural investment, Table 8.

c/ Without residential construction of farm houses.

d/ Preliminary.

Source: [25, p. 65].