APPENDIX B

METHODOLOGY

A. Table 1*

25X1C

The data on production of tractors in the Ukrainian SSR and on reported deliveries of tractors to Soviet agriculture are from Soviet publications. The division of production into those tractors produced at KhTZ and those produced at KhTSZ was estimated on the basis of 25X1B Soviet publications, 25X1C Because the Khar'kov plants are the only two well-established producers of tractors in the Ukrainian SSR, their production, sub-

tracted from total production in the Ukrainian SSR, provides a residual that is considered to represent production of Belarus' tractors at DAZ. This method was one of two reliable methods for estimating production at DAZ during 1957-60 but was only used as a check on other estimates for the period 1954-56.

Because of the various types of sources available, the estimates for the Khar'kov plants are fairly reliable. For example, production at KhTSZ for 1954 was available from Soviet publications along with total production of DT-54 tracklaying tractors, the type produced at 25X1B Khtz. for 1954 within a few hundred units of that shown for the latter plant in Table 1.* The figure 22,600 was used because of production indicated for DAZ from other sources.

Detailed methodology and sources for individual years are given below.

Total production of tractors in the Ukrainian SSR for 1953-55 is 25X1C ; and for 1958-60, in 25X1C given in for 1956-57, 25X1C

1. 1954

a. Khar'kov Tractor Assembly Plant (KhTSZ)

A breakdown of Soviet production of tractors by model is 25X1C given . It is reported that 11,300 KhTZ-7 wheeled tractors were produced in 1954. A variety of press reports of the period indicate that KhTSZ was the sole producer of the KhTZ-7 tractor in

* P. 14, above.

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1954 and that this model was the only model of tractor produced at the plant. Soviet production of KhTZ-7 tractors in 1954 thus represents the total production of tractors at KhTSZ in 1954.

b. Khar'kov Tractor Plant (KhTZ)

KhTZ produced only DT-54 tracklaying tractors in 1954. It was reported that 55,166 DT-54 tracklaying tractors were produced in the USSR in 1954. <u>51</u>/ This tractor also was being produced at the Stalingrad Tractor Plant and the Altay Tractor Plant in Rubtsovsk. at these three plants indi-

25X1B

cate that KhTZ produced about 22,000 to 23,000 tractors in 1954. <u>52</u>/ This preliminary estimate indicates that the residual of 6,500 units, representing output at DAZ and obtained by subtracting reported production of Belarus' tractors at Minsk from total Soviet production of these tractors, probably is reasonably accurate and that, therefore, an estimate of 22,600 tracklaying tractors for the KhTZ in 1954, derived by subtracting DAZ and KhTSZ production from total production in the Ukrainian SSR, is reasonably accurate also.

2. 1955

a. Khar'kov Tractor Assembly Plant

It was reported that 16,951 KhTZ-7 tractors were produced in the USSR in 1955. 53/ In 1955 the KhTZ-7 was produced at both tractor plants in Khar'kov. 25X1C have provided sufficient information to permit a reasonable estimate 25X1C of the breakdown between the two plants. the assembly line reported that approximately 2,200 KhTZ-7 tractors had been produced by mid-May after being in production for 4 months and that output had reached the rate of 50 to 60 per day. 54/ This figure generally is confirmed by a Soviet report that the first 150 tractors were produced at KhTZ in January 1955, another 350 were produced in February, and 600 were planned in March. 55/ July reported output of 40 to 50 units per day. 56/ The KhTZ-7 was phased out of production at KhTZ by the end of 1955, so that a rate 25X1C of about 40 tractors per day probably is a better estimate of average daily output for the period from mid-May to the end of the year than 50 to 60 a day. At this rate a total of about 9,500 tractors would have been produced by the end of 1955, including the 2,200 produced by mid-May. Subtracted from the total output for the USSR, this figure indicates production of about 7,500 KhTZ-7 wheeled tractors, the only one produced at KhTSZ in 1955.

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b. Khar'kov Tractor Plant

KhTZ produced both tracklaying and wheeled tractors in 1955, with an estimated total of 9,500 KhTZ-7 wheeled tractors being produced. In addition, KhTZ began the manufacture of the DT-14 in 1955 and had released slightly more than 1,000 units by the end of the year. <u>57</u>/ The DT-14 is a modernized diesel engine version of the gasoline engine KhTZ-7 and has a little more power. A total of about 10,500 wheeled tractors, therefore, was produced in 1955.

It was reported that 61,688 DT-54 tracklaying tractors were produced in the USSR in 1955. <u>58</u>/ The DT-54 was the only model produced at KhTZ. _______ of pos- 25X1B sibly as many as 27,000 units. <u>59</u>/ This preliminary estimate indicates that the residual of 15,100, which represents output at DAZ and is obtained by subtracting reported production of Belarus' tractors at Minsk from total Soviet production of these tractors, probably is reasonably accurate. Subtraction of the 22,600 units produced at DAZ and KhTSZ from the 57,300 tractors produced in the Ukrainian SSR leaves 34,700 built at KhTZ, of which 24,200 probably were tracklaying tractors.

3. 1956

a. Khar'kov Tractor Assembly Plant

KhTSZ produced only the KhTZ-7 and DSSh-14 tractors in 1956. Neither model was produced in any other plant. Soviet publications report that 350 KhTZ-7 tractors had been produced above plan by early February 1956 60/ and that 1,400 of them were delivered to agriculture in 1956,* which indicates production of about 1,500 units.** The KhTZ-7 was replaced at KhTSZ by the DSSh-14 self-propelled chassis, a type of four-wheeled tractor with the engine in the rear. The first 120 of the latter had been completed by August, <u>62</u>/ and a total of 1,500 by the end of the year, based on the reported delivery of 1,400 to agriculture. Thus KhTSZ produced a total of about 3,000 tractors in 1956.

b. Khar'kov Tractor Plant

KhTZ continued production of the DT-14 wheeled tractor in 1956 and was the only Soviet plant producing this tractor. The reported

* Data on the annual deliveries of tractors to agriculture are given

** The reported annual deliveries of tractors to agriculture are lower than annual production because of exports and allocations to nonagricultural uses such as construction.

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delivery of 16,200 DT-14 tractors to agriculture in 1956, coupled with indicate an output of about 17,000 DT-14

25X1B

25X1C

25X1B approximately 22,600 DT-54 tracklaying tractors were produced at KhTZ in 1956, 64/ representing the total production of this model in the Ukrainian SSR. Re-The KhTZ-20 tracklaying tractor, a variation of the DT-54, was introduced in 1956 but apparently was dropped after a short time. Combined production of wheeled and tracklaying tractors at KhTZ probably totaled

about 39,600 units. 25X1B for the two Khar'kov tractor plants were adjusted slightly to take into account production of 29,000 Belarus' tractors at Dnepropetrovsk in 1956, as reported by the chief engineer of KhTZ. 65/

4. 1957

tractors in 1956.

The report on plan fulfillment for the first half of 1958 gave percentage increases which show that 11,500 tracklaying and 25,600 wheeled tractors were produced in the Ukrainian SSR in the first half of 1957. 66/ Because the report on plan fulfillment for the entire year 1957 stated that production of tractors in the Ukrainian SSR was evenly divded between the first and second halves of the year (37,100 and 37,000 units, respectively) 625X1B and the report on plan fulfillment for

25X1C the first half of 1958 indicate continuing production of wheeled and tracklaying tractors in approximately the same proportions as in the past, it is assumed that production by type of tractor also was about evenly divided in 1957. Therefore, an estimated total of 51,200 wheeled tractors and 22,900 tracklaying tractors were produced in the Ukrainian SSR in 1957. The decrease in the second half of 1957 has been attributed to a slight drop in production of tracklaying tractors.

> Khar'kov Tractor Assembly Plant а.

KhTSZ produced only the wheeled DSSh-14 self-propelled chassis in 1957. This model was not produced in any other plant. Reported deliveries of 3,600 units to agriculture indicate production of about 4,000 units in 1957.

> ъ. Khar'kov Tractor Plant

The entire production of 22,900 tracklaying tractors in the 25X1B Ukrainian SSR in 1957 was concentrated in KhTZ. indicate that KhTZ also produced approximately 17,000 DT-14 wheeled tractors in 1957. 67/ 25X1C

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production of between 18,000 and 20,000 for the year on the basis of the midyear rate, but production dropped off in the second half of the year. This drop in production probably was the result of preparations being made for the switch to the DT-20 wheeled tractor at KhTZ in 1958. Only 13,500 of the DT-14 tractors were delivered to Soviet agriculture in 1957 compared with 16,200 in 1956. A total of about 39,900 wheeled and tracklaying tractors was produced in 1957.

5. 1958

a. Khar'kov Tractor Assembly Plant

KhTSZ produced both the DSSh-14 and the DVSSh-16 selfpropelled chassis in 1958. Soviet agriculture received 3,300 DSSh-14 self-propelled chassis in 1958. The estimate for the total production of 7,500 tractors at KhTSZ given in Table 1* is obtained as a residual when reported production at KhTZ is subtracted from an estimate for Khar'kov Sovnarkhoz.

b. Khar'kov Tractor Plant

According to a Soviet publication, the KhTZ produced 20,600 DT-54 tracklaying tractors in 1958, $\underline{68}$ / which comprises the total production of tracklaying tractors in the Ukrainian SSR. From this figure and the reported production of 11,800 tracklaying tractors in the Ukrainian SSR in the first half of 1958, $\underline{69}$ / it appears that production of tracklaying tractors was 3,000 units fewer in the second half of 1958 than in the first half. 70/

It also was reported that KHTZ produced 22,100 wheeled tractors in 1958. These were models DT-14 and DT-20, produced only at this plant. The DT-20 is a modernized and slightly more powerful version of the DT-14, which it replaced at some time in 1958. On the basis of reported deliveries of these two tractor models to agriculture, production at KHTZ may be estimated at about 12,200 DT-14's and 9,900 DT-20's. KHTZ thus produced a total of about 42,700 tractors in 1958.

When production of tractors at KhTZ is subtracted from the total production of tractors in the Ukrainian SSR, there is obtained a residual of 39,300 units that represents the aggregate production by KhTSZ and DAZ. The plan for 1965 has scheduled production of 107,000 tractors in the Ukrainian SSR in that year compared with 82,000 in 1958. $\underline{71}$ On the other hand, production of tractors in Khar'kov Sovnarkhoz in 1965 will be 2.13 times that of 1958. $\underline{72}$ A preliminary

* P. 14, above.

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estimate of about 49,000 to 50,000 tractors by KhTZ and KhTSZ in 1958, when applied to the rate reported above, indicates a plan for 1965 of very near the 107,000 tractors scheduled for the Ukrainian SSR as a whole. This production suggests that Khar'kov Sovnarkhoz probably will account for the entire production of tractors in the Ukrainian SSR in 1965 and also suggests that the two plan figures may be used in conjunction with one another to obtain an estimated production of 50,200 tractors in Khar'kov Sovnarkhoz in 1958. Subtracting reported production of 42,700 tractors at KhTZ from this total provides an estimate of 7,500 tractors for KhTSZ for 1958. Furthermore, the figure of 50,200 subtracted from the total production of 82,000 tractors in the Ukrainian SSR in 1958 provides an estimate of 31,800 tractors at DAZ in 1958.

6. 1959

a. Khar'kov Tractor Assembly Plant

The total production of tractors in the Ukrainian SSR dropped only slightly below the level of 1958, and it is assumed, therefore, that there was no major change in the level of output at the individual plants. **25X1B** production of approximately 7,000 self-propelled chassis in 1959. 73/ The figure of 7,500 is used in Table 1* merely to be in accord with the stated assumption that production was about the same. In this respect, production at DAZ would be underestimated for 1959 to the extent that 7,000 is a more accurate estimate for KhTSZ than is 7,500. Production at KhTZ has been reported in a Soviet publication.

b. Khar'kov Tractor Plant

It was reported that 42,800 tractors were produced at KhTZ in 1959, of which 20,600 were tracklaying and 22,200 were wheeled. <u>74</u>/ Most of the wheeled tractors were of the DT-20 model. A small number of the DT-14 model were manufactured. As in previous years the tracklaying tractors were the DT-54 model.

7. 1960

a. Khar'kov Tractor Assembly Plant

KhTSZ had a plan for 1960, announced in January 1960, for production of 5,000 units of "an improved model" of a self-propelled chassis. <u>75</u>/ Presumably, production of the older model did not cease immediately. It is estimated, therefore, that production at KhTSZ in 1960 was approximately the same as in 1959. The estimate has been

* P. 14, above.

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increased slightly to 8,000 units to reflect the reported increase in the total production of tractors in the Ukrainian SSR to 88,000 units compared with 80,800 in 1959.

b. Khar'kov Tractor Plant

Most of the increase (7,200 units) in production of tractors in the Ukrainian SSR in 1960 compared with that in 1959 probably came 25X1C from KhTZ. a range of production of 48,000 to 50,000 tractors in 1960. <u>76</u>/ The midpoint of this range has been given for the estimated output at KhTZ. KhTZ dropped production of the DT-54 tracklaying tractor in 1960 and replaced it with an improved and more powerful model, the T-75.

B. Tables 2 and 5*

One method of estimating production of Belarus' tractors at DAZ during 1956-59 is to determine the total Soviet production of these tractors on the basis of reported annual deliveries to agriculture and to subtract production at MTZ from the total production in the USSR. Essential to this method is the indication in Soviet publications and in reports of foreign visitors that MTZ and DAZ are the only two plants producing Belarus' tractors.

Table 2 is designed to show total production of Belarus' tractors for use with data on production of these tractors at MTZ presented in Table 3.** The methodology outlined here carries through the process of subtracting output at MTZ from the total to obtain the residual, which represents production at DAZ. The latter data are incorporated into Table 5. The data on DAZ presented below will differ slightly from the range given in Table 5 because Table 5 also incorporates data on production of tractors at the two Khar'kov plants. The latter data provide estimates for production of tractors at DAZ during 1957-59, which was 500 to 1,000 units higher each year than those provided by the analysis described below.

Annual deliveries of Belarus' tractors to agriculture are reported

This analysis provides a range, although a narrow one, for the estimated production at DAZ during 1956-59 because, in one instance, it has been assumed that production in 1956 is unknown and must be estimated

** P. 17, above.

25X1C

*** The delivery figure for 1954 was derived by subtracting reported deliveries in 1953 and 1955 from reported total deliveries for the period 1951-55.

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^{*} Pp. 16 and 19, respectively, above.

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with the aid of data for 1953-55 concerning the number of Belarus' tractors delivered to agriculture, and, in the second instance, it has been assumed that production at DAZ amounted to 29,000 units in 1956, as reported by the chief engineer of KhTZ.* The estimates for 1957-59 also are based on the assumption that the percentage of production delivered to agriculture annually in this period is approximately the same as the average for 1953-56.

The steps involved in making the estimates for Table 2 are outlined in detail below.

1. Step 1

Step 1 involves calculating the share of production of Belarus' tractors delivered to agriculture annually during 1953-55. In this instance, production at DAZ in 1956 is assumed to be unknown. The data necessary for this calculation have been and are presented in the following tabulation.

Belarus' Tractors	1953	<u> 1954</u>	1955	Total <u>1953-55</u>
Production (thousand units) Number delivered to agriculture	0.5	14.8	27.9	43.2
(thousand units) Percentage of production delivered to agriculture	0.4	13.2	23.9	37.5
	80.0**	89.2	85.7	86.8

2. Step 2

In Step 2 the average percentage of production delivered to agriculture during 1953-55, assumed to be representative for subsequent years, is applied to reported deliveries of Belarus' tractors to agriculture during 1956-59 in order to arrive at an estimate of

** This percentage is not particularly accurate, for small numbers are being treated in rounded form. Production in 1953, unrounded, amounted to 469 units. An unrounded figure for deliveries to agriculture is not available.

^{*} The production figure for 1956 for DAZ given by the chief engineer of KhTZ probably is reasonably accurate, although it undoubtedly is a rounded figure. The choice of an alternative estimate for 1956, however, is made primarily to serve as a rough check on the 29,000 figure and, secondly, to improve the time series for calculating the average percentage of production of Belarus' tractors delivered to agriculture by expanding the series an additional year.

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the total Soviet production of Belarus' tractors for each year of the latter period. If production at MTZ is subtracted from this total, the residual obtained represents estimated production of Belarus' tractors at DAZ. These data are presented in the tabulation below.

Belarus' Tractors	1956	<u>1957</u>	1958	<u>1959</u>
Number delivered to agriculture (thousand units) Percentage of production	39.7	42.6	46.3	51.9
delivered to agriculture, 1953-55 average	86.8	86.8	86.8	86.8
Estimated total Soviet produc- tion (thousand units)	45.7	49.1	53.3	59.8
Minus production at MTZ (thousand units)	-16.0	- 19.2	-22.5	-30.3
Estimated production at DAZ (thousand units)	29.7	29.9	30.8	29.5

3. Step 3

An essential factor in the third step is the acceptance of the production figure for 1956 for DAZ that 25X1C for the chief engineer of KhTZ in mid-1957. This official stated that 29,000 Belarus' tractors were produced at Dnepropetrovsk in 1956 and that 30,000 would be produced there in 1957. 79/ The addition of the 29,000 units produced in 1956 at DAZ to the 16,000 produced in 1956 at MTZ provides an estimated total production of 45,000 Belarus' tractors in 1956. This figure may be tabulated in a manner similar to that of Step 1 above in order to arrive at an estimate of the share of production delivered to agriculture during 1953-56. The data for calculating the average percentage of production delivered to agriculture during 1953-56 is presented below.

Belarus' Tractors	1953	1954	1955	1956	<u>1953-56</u>
Production (thousand units) Number delivered to agriculture	0.5	14.8	27.9	45.0	88.2
(thousand units) Percentage of production	0.4	13.2	23.9	39.7	77.2
delivered to agriculture	80.0*	89.2	85.7	88.2	87.5

Totel

* This percentage is not particularly accurate, for small numbers are being treated in rounded form. Production in 1953, unrounded, amounted to 469 units. An unrounded figure for deliveries to agriculture is not available.

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4. Step 4

The fourth step is similar to the second step. The average percentage of production delivered to agriculture during 1953-56, assumed to be representative for subsequent years, is applied to reported deliveries of Belarus' tractors to agriculture during 1957-59 in order to arrive at an estimate of total Soviet production of Belarus' tractors for each year in the latter period. If production at MTZ is subtracted from this total, the residual obtained represents estimated production of Belarus' tractors at DAZ. These data are presented in the following tabulation.

Belarus' Tractors	1957	1958	1959
Number delivered to agriculture (thousand units) Percentage of production	42.6	46.3	51.9
delivered to agriculture, 1953-56 average	87.5	87.5	87.5
Estimated total Soviet produc- tion (thousand units)	48.7	52.9	59.3
Minus production at MTZ (thousand units)	- 19.2	-22.5	-30.3
Estimated production at DAZ (thousand units)	29.5	30.4	29.0

C. Table 3*

1. 1952-55

25X1C The basic data for the period 1952-55 are contained in 15 given in this source. Because MTZ is the sole producer of tractors in the Belorussian SSR, the data for the republic are necessarily the data for that plant.

> The total production of logging tractors and Belarus' tractors for the USSR also is given in the same source. Because MTZ was the sole producer of logging tractors during 1952-55, production of Belarus' tractors at Minsk was obtained by subtracting production of logging tractors from the total production of tractors at MTZ. MTZ is shown to have accounted for the entire Soviet production of Belarus' tractors in 1953.

* P. 17, above.

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2. <u>1956</u>

The estimate for the total production of tractors at Minsk in 1956 is based on an index of unit production published in a Soviet agricultural journal. $\underline{81}$ / This journal reported that production in 1956 was 417 index points compared with an index of 100 in 1952.

The estimate for production of Belarus' tractors in 1956 is based on the report that production of these tractors at the Minsk plant increased 25 percent compared with that in 1955. $\frac{82}{}$ The estimate obtained from this calculation was subtracted from the total production of tractors at Minsk to obtain the estimate for production of logging tractors in 1956.

3. <u>1957</u>

The estimate for the total production of tractors at MTZ in 1957 is based on the report that production increased 17 percent compared with that in 1956. $\underline{83}/$

The estimate for production of Belarus' tractors in 1957 is based on the monthly average of aggregate production in 1956 and 1958. The total production for 1956 and 1958 was 38,500 Belarus' tractors, or a monthly average of 1,600. The estimate of 19,200 tractors thus obtained for 1957 appears reasonably sound in view of the rate of growth of the total production of tractors at MTZ during 1956-58. Production of logging tractors again was obtained by subtracting production of Belarus' tractors from the total.

4. 1958

The estimate for the total production of tractors at MTZ in 1958 is based on the report that production increased 5 percent compared with that in 1957. 84/ A Soviet journal reported that a total of 375,000 tractors would be produced in the USSR in 1965, 85/ and a that MTZ would produce 18 out of 25X1C every 100 tractors produced in the USSR in 1965 and that it would produce three times the number of Belarus' tractors produced in 1958. 86/ Eighteen percent of the total planned production of tractors in 1965 would amount to 67,500 tractors scheduled for production at Minsk, which, in turn, indicates production of about 22,500 Belarus' tractors there in 1958. As of the dates of the above information (February and April 1959), it was clear that Minsk was to specialize in production of Belarus' tractors in the future. 25X1C the logging tractor was withdrawn from production at Minsk in 25X1C 1958, 877 which is borne out by the drop in output of these tractors in 1958 compared with that in 1957. As for earlier years, the estimate of

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production for logging tractors was obtained by subtracting production of Belarus' tractors from the total production.

5. 1959

The estimate for the total production of tractors at MTZ in 1959 is based on the report that production increased 16 percent compared with that in 1958. 88/ This same estimate is obtained if the reported production of tractors in the RSFSR, the Ukrainian SSR, and the Uzbek SSR $\underline{89}$ / is subtracted from total Soviet production of tractors in 1959. There was some production of self-propelled chassis in the Georgian SSR in 1959, but this elimination process indicates that it was at an insignificant rate.

It was reported that logging tractors would be withdrawn from production at Minsk in 1958 and that this withdrawal would permit an increase of 35 percent in the output of Belarus' tractors in 1959 above that in 1958. <u>90</u>/ This increase would indicate a 1959 plan of about 30,300 to 30,400 units, all of which were Belarus' tractors.

6. 1960

The estimate for the total production of tractors at MTZ, based on a reported increase of 14 percent in production above that in 1959, 91/ amounts to about 34,500 units. On the other hand, when the reported production of tractors in the RSFSR, the Ukrainian SSR, and the Uzbek SSR in 1960 is subtracted from total Soviet production of tractors, 92/ there is obtained a residual of 34,400 tractors, which represents production in the Belorussian SSR (MTZ) and the Georgian SSR (Georgian Agricultural Machinery Plant in Tbilisi). One of these estimates is as good as the other because each is a product either of rounded annual percentage increases in production or of rounded quantitative production data. Either figure also contains the insignificant level of production of self-propelled chassis estimated for 25X1C the Georgian SSR. mass production of self-propelled chassis was organized in the Georgian SSR in 1960 and that production doubled compared with that in 1959. 93/ It is doubtful, however, that production exceeded 100 units in 1960.

7. 1961

The production plan for 1961 was taken from

25X1C

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