

Afghanistan Wheat Planting Survey 1992/93

Helmand, Kandahar, Ghazni, and Herat Provinces

Afghanistan Agricultural Sector Support Project/
Private Sector Agribusiness

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EXECUTIVE SUMMARY

The Afghanistan Agricultural Sector Support Project (ASSP) has been involved in an ongoing assessment of cereals production for Afghanistan. Developing better wheat acreage and production estimates have been an important part of this assessment - particularly since other estimates are either unreliable or lack statistical rigor, and conflict with each other. Improving upon estimates of current production of Afghanistan's most important foodgrain, wheat, is an essential first step toward determining food availability and planning for the rehabilitation of the agricultural sector.

A wheat planting survey was undertaken by ASSP during the fall of 1992. The objectives of the survey were twofold. First, to provide an indication of the area planted to wheat and allow preliminary production projections for 1993 to be made well in advance of the actual harvest. And second, to use the information to check the accuracy of the satellite imagery interpretation showing agricultural areas, and the validity of assumptions used in earlier mathematical models to estimate wheat production. Because most rainfed wheat is planted early in the new year, the wheat planting survey was limited to irrigated areas.

The survey methodology is best described as a modified area frame sampling technique. Sample points were selected at random from areas identified as "irrigated agriculture" from satellite imagery by the Earth Satellite Corporation (EarthSat), a U.S. based subcontractor to DAI. The procedure then required that survey teams go to the sample points using a geographic positioning device (GPS), and record the land use along a 500 meter survey line. The teams were also instructed to interview farmers, where available, about their cultural practices. The wheat planting survey is the second effort undertaken by the project to estimate wheat area for Afghanistan using this methodology. The first survey done in Balkh and Jawzjan Provinces in the northern part of the country also involved taking crop cut samples to estimate wheat yields.

Eleven provinces were initially selected for the wheat planting survey based on their share of total agricultural area. These provinces are thought to account for over two-thirds of the total agricultural land in Afghanistan and further have the advantage that they represent all the historically important agricultural regions in the country. However, because of poor security conditions in northern and other parts of Afghanistan, the survey was limited to four provinces: Kandahar, Helmand, Ghazni, and Herat.

The teams completed 52 sample points in Helmand, 48 in Kandahar, 41 in Ghazni, and 49 in Herat Province. The survey was unable to cover the provinces completely because poor security conditions made several sample points inaccessible, and because the approach taken

in numbering the points systematically excluded the southern most portion of each province. For each sample point not completed, the surveyors substituted contingency points, also randomly selected, from a numbered list provided to them.

Farmers were interviewed about their planting plans in some cases where the surveyors reached the sample points before the winter crop had been planted. As a result, the estimates are based on a mixed methodology of direct observation and interview. This methodology tends to impart upward and downward biases to the estimates, although the biases are not thought to have substantially affected the results.

The survey found that the proportion of satellite imagery defined "irrigated agricultural area" that was under wheat varied considerably among provinces. It accounted for a third of the total area in Helmand, about a quarter in Ghazni and Herat, and only one-fifth in Kandahar Province. These results are largely consistent with the findings of an earlier ASSP survey for Balkh and Jawzjan Provinces where a third of the total "agricultural" area was estimated as being under wheat. Further, wheat accounted for between 50-65% of the total crop area in all provinces except Helmand where it was considerably higher.

The total irrigated wheat area planted for 1992/93 is estimated at 73,587 hectares for Helmand, 39,232 ha for Kandahar, 32,961 ha for Ghazni, and 52,105 ha for Herat. These estimates refer to land under fall planted wheat in areas classified as "irrigated agriculture" from satellite imagery. They exclude spring planted irrigated wheat (where present) as well as whatever irrigated wheat might be planted in satellite imagery defined "rainfed agricultural areas." Since nearly all the irrigated wheat in Helmand and Kandahar Provinces is planted in the fall and winter, the wheat area estimates for these two provinces are thought to better represent the total irrigated wheat acreage.

A comparison with other estimates suggests that, with the exception of Helmand Province, the irrigated wheat area for 1992/93 is lower than what it was in pre-war years, and substantially lower than recent estimates obtained from preliminary interpretation of satellite imagery. Provisional irrigated wheat production projections have also been made for each province. However, these projections are extremely tentative because they depend upon uncertain assumptions about wheat yields.

Despite its limitations with respect to non-sampling errors and incompleteness, the ASSP survey demonstrates that its methodology to estimate crop area is practical in the unique set of circumstances that exist in Afghanistan. This methodology can provide objective and reliable estimates of crop area (and production when combined with crop cut samples) with a relatively modest outlay of resources.

It is unclear, however, whether a wheat planting survey in fall is advisable given the problems associated with combining farmer interviews with direct observation and the inability to cover rainfed areas. A better alternative may be to carry out the survey in March whose results would still become available three months earlier than a June wheat production survey.

3. RESULTS AND ANALYSIS

3.1 Implementation of Survey Method

The survey was carried out during November and December 1992. However, because of poor security conditions in northern and other parts of Afghanistan, the survey was limited to four provinces: Kandahar, Helmand, Ghazni, and Herat. The likelihood that the survey teams would have been unable to return to Pakistan before the project completion date of 31 December 1992 was another consideration to exclude the northern provinces from the survey. The teams which surveyed Kandahar, Helmand and Ghazni returned to Islamabad in mid December and those that covered Herat in the first week of January. All teams were extensively debriefed in Peshawar and Islamabad in order to understand their experience in carrying out the survey and to clarify questions which arose during the editing and coding of the survey forms.

The teams completed 52 sample points in Helmand, 48 in Kandahar, 41 in Ghazni, and 49 in Herat Province. The additional observations for Helmand were due to faulty communications between different survey teams in the field. Fewer observations were completed for Ghazni because poor security conditions made sample points in the western half of the province inaccessible.⁶ In particular, sample points falling in Navor and Malestan areas in Ghazni and Musa Qala and Baghran in Helmand were excluded from the survey because of security considerations based on ethnic tension or reported fighting among different Afghan factions.

For each sample point excluded, the surveyors substituted the first contingency point available from the numbered list provided to them. In a few cases, the contingency point closest to the original point was selected if located nearby. The largest number of contingency points were completed for Ghazni Province because of the surveyor's inability to reach the original sample points.

During the process of overlaying the random points with irrigated agricultural areas, the ARC-INFO software sorted the randomly numbered sample points by latitude. This had the effect of numbering the sample points in ascending order starting from the top left hand corner of the grid. Because the first fifty numbers were designated as primary sample points, a proportion of the total irrigated area in each province - by definition in the bottom half - was excluded from the survey. This proportion depended upon the number of total points falling in irrigated areas for each province.

⁶ The western half of the province is populated by Hazaras, an ethnic group in Afghanistan, and characterized by lawlessness, banditry, and kidnapping in recent months due to tension among different ethnic groups.

Since the surveyors substituted contingency points for sample units they could not cover, the actual coverage of a province is based on the number of alternate points selected. The surveyors were instructed to pick the contingency points in ascending order from a numbered list when they were unable to complete a primary sample point. A rough approximation of the physical coverage of irrigated areas for each province is therefore indicated by the ratio of the last numbered point completed to the total number of points. According to this indicator, the survey covered 69% of the irrigated area in Kandahar, 68% in Herat, 87% on Ghazni, and 94% in Helmand Province. For Ghazni Province, the surveyors sampled all the points, including contingency points, in the eastern half of the province because the western Hazara half was inaccessible.

It is not known whether land use patterns in areas the surveyors failed to reach were different in any way from those they surveyed. It is difficult, therefore, to draw any conclusion about whether the results were biased in any way, nor about the direction and magnitude of the bias, if any. It is assumed, in computing the provincial estimates, that the areas excluded due to security reasons and the sample numbering error are similar in terms of land use patterns to the ones covered by the survey.

In some cases, the surveyors reached the sample points before the winter crop had been planted. This was due to inaccurate information about planting times in different areas; although the existence of a long planting season made it difficult to identify precisely the dates by which most of the area would have been planted in winter crops. It is also possible that planting dates have changed in recent years so that pre-war conventional wisdom about when farmers sow their crops is no longer valid. In the cases where they were early, the surveyors interviewed farmers to ascertain what, if any, crop the latter planned to grow on specific plots, and recorded the responses accordingly. This occurred at several sample points in Helmand, Kandahar and Herat, but not in Ghazni where the fall planting is completed earlier before the arrival of the winter snow. Farmers were also interviewed in cases where the surveyors could not identify the crop planted with certainty.

One implication of combining direct observations with farmer interviews is that the results should be interpreted as including planned as well as actual cropped area although the distinction between the two may not be important in practice as discussed below.

The fact that the sample is based on a mixed methodology tends to impart both upward and downward biases to the crop area estimates. The upward bias occurs because some of the observations recorded planting plans which may not have been realized due to a number of reasons including the non-availability of labor, water and seed. Also, farmers are likely, while reporting planned crop area, to

ignore small tracts which could not be cultivated because of, for example, the field gradient or poor soils. The downward bias occurs in cases where the farmers were not available for interview and the surveyors recorded the area as "fallow" or "uncultivated" although it may have been subsequently planted.

These biases are not thought to have substantially affected the results for the following reasons. First, in many cases the land for which interview responses were recorded had been prepared for planting. It is unlikely that farmers would have ploughed land if they were not reasonably confident that they could plant a crop on it. Second, the measurements were recorded on a plot-by-plot basis even where the information was obtained through an interview. This reduced the likelihood of farmers over estimating crop area by ignoring small non-cultivable patches. Finally, farmers were interviewed in almost all cases where the winter crop had not yet been sown, which reduced the possibility of erroneously classifying cropped area as fallow or uncultivated.

It was not possible to quantify these non-sampling errors because of the inability to distinguish between information from direct observation and farmer interviews for comparable provinces.⁷ It is assumed in calculating the areas estimates, therefore, that the upward and downward biases offset each other.

The data was edited, pre-coded, and entered into dBase IV, and the results analyzed using Lotus 1-2-3 computer software.

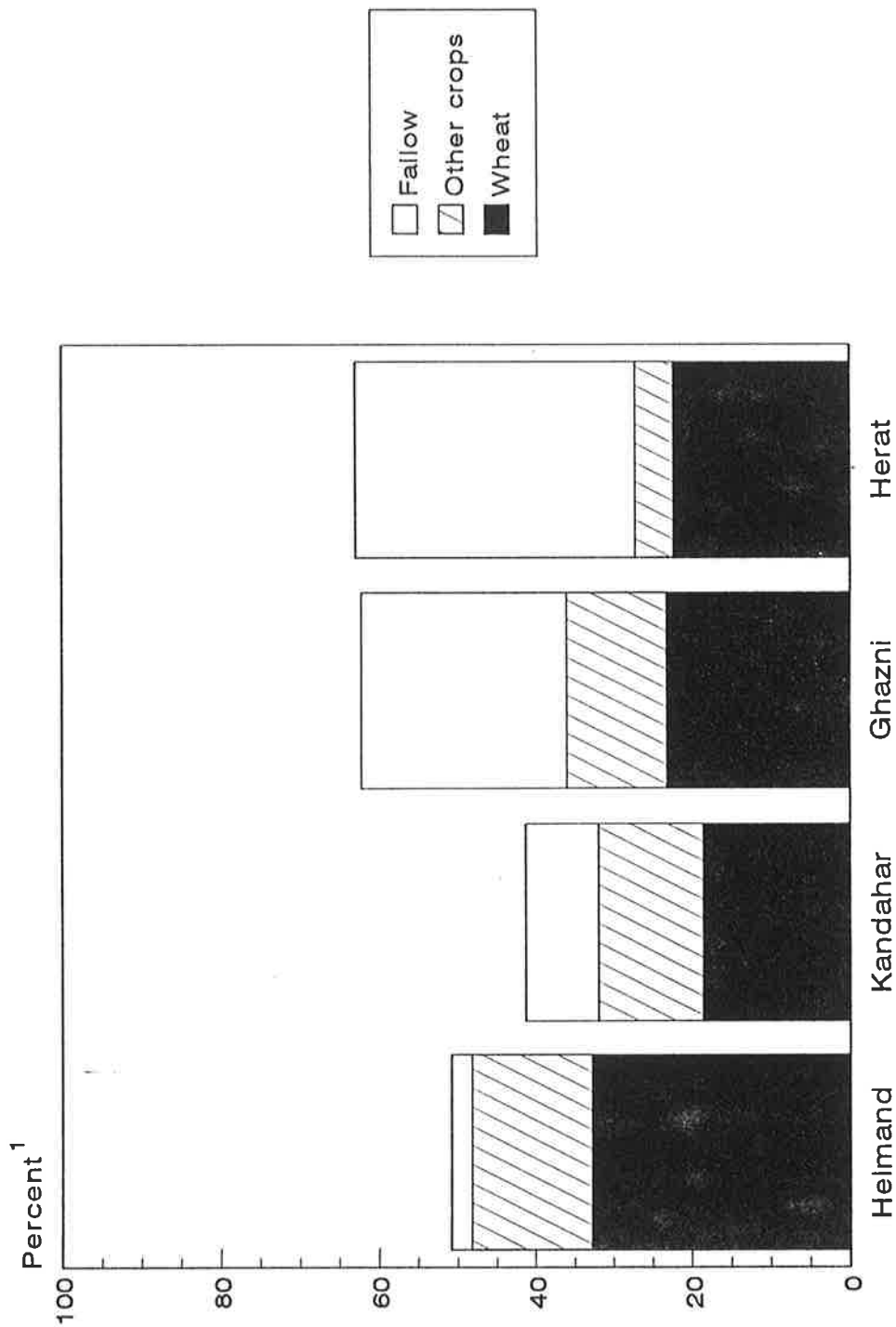
3.2 Irrigated Wheat Area Estimates - 1992/93

Estimates of the average proportion of area under different land use categories for Helmand, Kandahar, Ghazni and Herat Provinces are shown in Figure 3.1 and its related table.⁸ These estimates refer to land use patterns in areas classified as "irrigated agriculture" from satellite imagery. The latter classification does not necessarily indicate actual irrigated status.

⁷ Measurement and interview response biases are referred to as "non-sampling" errors. They are distinguished from sampling errors which occur because only a proportion of the population has been sampled, and which can be computed precisely. The total error of a sample estimate is the sum of sampling and non-sampling errors.

⁸ See Appendix E for details of how the estimates and sampling errors were calculated.

Figure 3.1 Irrigated Agriculture Land Use Patterns, 1992/93
 Selected Provinces, Afghanistan



1. Of area identified as irrigated agriculture from satellite imagery

Table 3.1 LAND USE PATTERNS IN IRRIGATED AGRICULTURAL AREAS - SELECTED PROVINCES, AFGHANISTAN

	Helmand		Kandahar		Ghazni		Herat	
	[1]	c.v. [2]	[1]	c.v.	[1]	c.v.	[1]	c.v.
Proportion under:								
Irrigated Wheat	0.32	14	0.19	24	0.23	16	0.22	20
Rainfed Wheat	0.01	100	0.00	-	0.00	-	0.01	75
Total Wheat	0.33	14	0.19	24	0.23	16	0.23	19
Poppy	0.12	21	0.00	-	0.00	-	0.00	-
All Crops	0.48	11	0.32	18	0.36	13	0.27	17
Fallow	0.03	53	0.09	37	0.26	17	0.36	15
Total Cultivable [3]	0.51	11	0.41	16	0.62	10	0.63	9
Wheat as % of all crops	0.68	-	0.58	-	0.64	-	0.85	-

- [1] Proportion of satellite imagery defined irrigated agricultural area.
 [2] Coefficient of variation expressed as a percentage of the estimate.
 [3] Total cultivable area = area under all crops + fallow.

Source: ASSP 1992 Wheat Planting Survey

The proportion of area under wheat varies considerably among provinces. It accounted for a third of the total area in Helmand, about a quarter in Ghazni and Herat, and only 19% in Kandahar province. The coefficient of variation which indicates the statistical reliability of the estimates is 14% for Helmand, 24% for Kandahar, 16% for Ghazni, and 19% for Herat.⁹ The higher coefficient of variation for Kandahar reflects the lower overall proportion of wheat area in the province as well as the greater variability in wheat area along the sample survey lines.

In comparison, about a third of the total area was estimated as planted in wheat by a previous ASSP survey for both Balkh and Jawzjan Provinces - although for Jawzjan it included both rainfed and irrigated wheat area.¹⁰ The proportion of land under wheat for Ghazni and Herat is likely to be higher when spring planting is

⁹ The higher the coefficient of variation or standard deviation of the estimate, the larger the confidence interval around the mean, and the lower the probability that the sample estimate approximates the true population mean.

¹⁰ This survey was carried out in June 1992 (see Afghanistan 1992 Wheat Production Survey - Balkh and Jawzjan Provinces. ASSP/DAI. Islamabad. October 1992).

accounted for since a part of the irrigated area in those provinces is sown after the winter snows melt. This implies that, with the exception of Kandahar, for which estimates are less reliable, the wheat area is fairly consistent across all the provinces surveyed - at one-fourth to one-third of the total satellite imagery identified agricultural area. Also, the land planted in wheat varied between one-half to two-thirds of the total crop area in all the provinces surveyed except in Herat where it was much higher. Only at a few sample points in Herat, and one point in Helmand, was rainfed crop land found in areas classified as irrigated agriculture from satellite imagery.

The survey found that poppy accounted for nearly 12% of the total irrigated agricultural area and about a third of the wheat area, in Helmand province. The latter province is reported to be one of the largest producers of poppy in Afghanistan. The coefficient of variation for the proportion estimate is 21%. In contrast to wheat, for which information was derived from a combination of observation and interviews, the poppy estimate is based entirely on farmer interviews. This is because the crop had not been planted at any of the sample points at the time the survey was carried out. As a result, the poppy area proportion estimate for Helmand more accurately represents planned rather than actual area. Surprisingly, no poppy was reported for Kandahar which is also regarded a major opium producing province. The reasons for this are not known.¹¹

Fallow land accounted for 3% of the total area in Helmand, 9% in Kandahar, 26% in Ghazni, and 36% in Herat. The lower estimates for Helmand and Ghazni are in part due to definitional problems resulting from the time of year the survey was carried out. Unlike Ghazni, the winter crop had not yet been planted at many sample points in these provinces. As a result, fallow land was reported to be for the winter crop or classified as uncultivated if no winter crop was planned. On the other hand for Ghazni and Herat, the fallow proportion estimates include land which would be planted in spring.

The distinction between different "non-crop" land use categories was not adequately explained or defined during the training of surveyors. As a result, the surveyors used a variety of terms to describe non-crop land use categories, sometimes inconsistently. The inconsistent interpretation of these land use categories does

¹¹ During the debriefing, the surveyors confirmed that they observed cannabis and poppy plots in some areas in the province, but that these crops did not fall along the survey line at the sample points. The surveyors also reported that they did not observe any poppy in Herat which they attributed to the discouragement of poppy cultivation by the provincial authorities.

not affect the crop area estimates. The more important terms include "shudyar", "kasht-na-shuda", "bura", "alafchar" and "la-mazruh".

Most surveyors understood "shudyar" to mean land that had been ploughed but would not be planted. "Kasht-na-shuda" literally means uncultivated or, more precisely, "not cultivated". The majority of surveyors used this term to refer to agricultural land on which a crop had been grown in the past but which had not been recently ploughed. A few surveyors used "kasht-na-shuda" synonymously with "shudyar". Some surveyors also distinguished between "kasht-na-shuda" and "matruka" land where the latter referred to agricultural area that had been abandoned. "Bura" was another term sometimes used interchangeably with "kasht-na-shuda", but in other cases, it referred to agricultural land that had been harvested but not ploughed for the next crop. Finally, "alafchar" was used to describe pastures, and "la-mazruh", barren or uncultivable land.

In coding the plot measurements, the main concern centered on defining "fallow land" in a way which would not be distorted by the inconsistent interpretation and use of different terms for non-crop land use categories. For the purpose of this report, fallow land is assumed to comprise land which is not uncultivable ("alafchar" and "la-mazruh") or has not been planted with crops. Therefore, "shudyar", "bura", "kasht-na-shuda" and "matruka" land are all classified as fallow.

"Fallow land" plus "crop area" then provides a rough estimate of cultivable or potential agricultural land - although the concept may not be very meaningful in Afghanistan where water, not land, is the binding constraint to agricultural production.

For Balkh and Jawzjan Provinces, the earlier ASSP survey estimated the fallow land in irrigated areas as varying between 3-5% of the total area, but was defined as including only "shudyar" land (area ploughed but not planted).

Cultivable area, defined as "crop area" plus "fallow", accounted for about 40-60% of the total satellite imagery defined agricultural area in all provinces.¹² Unless it reflects more recent changes, the difference in the proportion of cultivable (and crop) area between Kandahar and Helmand is surprising. Since the two provinces have similar topographic and agricultural system characteristics, the satellite imagery based classification of agricultural areas is expected to be fairly consistent. Nevertheless-a substantial number of sample points for Kandahar were found to be uncultivable and comprising water-logged land

¹² Cultivated area for Balkh and Jowzjan Provinces was estimated by the earlier ASSP survey to vary between a half to two-thirds of total area.

covered with reeds. It is possible that these reeds were picked up as vegetation and the areas erroneously classified as agricultural in the process of interpreting the satellite imagery.

Wheat (and poppy) acreage was calculated by multiplying the total irrigated agricultural area by the estimated proportion of land under that crop. The assumptions and the resulting estimates are shown in Table 3.2. The coefficients of variation for the area estimates are the same as those reported for the underlying proportion estimates in Table 3.1.

TABLE 3.2 ESTIMATED WHEAT AREA 1992/93 - SELECTED PROVINCES, AFGHANISTAN

	Helmand	Kandahar	Ghazni	Herat
Irrigated area (hectares) [1]	228,532	239,510	141,830	233,235
Proportion under Wheat [2]				
actual irrigated	0.32	0.19	0.23	0.22
actual rainfed	0.01	0.00	0.00	0.01
Wheat Area (hectares) [3]				
actual irrigated	73,587	44,573	32,961	52,105
actual rainfed	1,325	0	0	2,169
total	74,913	44,573	32,961	54,274

[1] Earthsat estimate based on satellite imagery interpretation.

[2] Computed from 1992 wheat planting survey.

[3] 1*2.

Source: DAI/ASSP

For 1992/93, the total wheat area is estimated at 73,587 hectares for Helmand, 39,232 ha for Kandahar, 32,961 ha for Ghazni, and 52,105 ha for Herat. These estimates refer to land under fall planted wheat in areas classified as irrigated agriculture from satellite imagery. They exclude spring planted irrigated wheat (where present) as well as irrigated wheat in satellite imagery defined rainfed agricultural areas. Also, the land under rainfed wheat in "irrigated" areas may be underestimated where it is planted in the spring.

Among the provinces surveyed, only farmers in Ghazni and Herat plant a part of irrigated wheat in spring. In Kandahar and Helmand, all of the irrigated wheat is planted between November and January. Consequently, the wheat area estimates for these two provinces are thought to better represent the total irrigated wheat acreage.

The possibility of substantial land being under irrigated wheat in "rainfed" areas is considered remote given the satellite imagery interpretation process by which agricultural areas are classified by irrigation status. No irrigated wheat was found in areas classified as rainfed in the spring 1992 ASSP wheat survey of Balkh and Jawzjan Provinces, where most of the sample points were in rainfed areas. Areas classified as irrigated in Jawzjan, however, often contained rainfed wheat.

The area under poppy for Helmand Province is estimated to be about 26,000 ha based on calculations similar for wheat. This estimate may be somewhat high since it is entirely based on the planting plans of farmers rather than actual cultivation.

3.3 Comparison with Other Crop Area Estimates

The irrigated wheat area survey estimates for Helmand, Kandahar, Ghazni and Herat are compared with other official and non-official estimates for those provinces in this section. The latter estimates are based on different methodologies and provide a context in which the wheat planting survey figures can be placed.

Table 3.3 presents alternative estimates for the surveyed provinces. It should be kept in mind that the wheat planting survey estimates for Ghazni and Herat understates the actual irrigated wheat area because it does not include spring planted wheat. Approximately 5-10% of the total irrigated wheat in those provinces is thought to be planted in spring. Also, the survey estimates understate the total irrigated wheat area to the extent that irrigated wheat exists in areas classified as rainfed from satellite imagery. As discussed earlier, this is not considered likely.

The EarthSat irrigated wheat estimates are based on agricultural areas identified from satellite imagery, to which reduction factors are applied to account for non-wheat crops and fallow land. The Government of Afghanistan (GOA) wheat area estimates for 1992 are derived from information provided by Ministry of Agriculture's extension agents and past data. The GOA/FAO Agricultural Survey, 1966/67, is reported to have been based on a probability survey but information on its methodology, coverage, or accuracy is not available. Also, the estimates from this survey refer to area under cereal crops which include maize, barley and rice in addition to wheat. The UNIDATA wheat area estimates appear to be based on a rapid appraisal non-probability survey.

Except for Helmand Province, ASSP survey estimates of the wheat area are substantially lower than those reported by EarthSat and the GOA/FAO Agricultural Survey. The difference with the GOA/FAO figures is less when the latter are adjusted to account for double cropping.

TABLE 3.3 IRRIGATED WHEAT AREA ESTIMATES - SELECTED PROVINCES, AFGHANISTAN

(hectares)

	Helmand	Kandahar	Ghazni	Herat
ASSP Wheat Planting Survey 1992/93	73,587	44,573	32,961	52,105
EarthSat, 1990 [1]	69,260	106,310	161,200	126,070
Government of Afghanistan, 1991/92 [2]	52,000	50,000	31,000	103,000
UNIDATA, 1991 [3]	na	78,000	41,422	na
GOA/FAO Agricultural Survey, 1966/67 [4]	119,180	103,880	96,760	136,340
Adjusted for double cropping [5]	79,453	69,253	64,507	90,893

[1] "Final Report: Summary of Developments for Cropcast 1990 Afghanistan Wheat Production Assessment", Earth Satellite Corporation, 1991.

[2] Unpublished estimates obtained from Ministry of Agriculture, GOA, Kabul.

[3] Socio-Economic Profiles for Kandahar and Ghazni Provinces, UNIDATA.

[4] "Afghan Agriculture in Figures", Central Planning, Government of Afghanistan.

[5] Assuming a cropping intensity of 150%.

na = not available

Note: Agricultural Survey, 1966/67 figures refer to area under cereal crops including maize, rice, and barley.

There could be a number of reasons why the wheat area survey estimate for Helmand is higher than that of EarthSat. First, EarthSat used a larger reduction factor to derive wheat from total agricultural area for this province. As a result, the Earthsat wheat area estimate for Helmand is much lower than that for Kandahar even though the total irrigated agricultural area for both provinces is approximately equal. Second, the survey estimate possibly overstates somewhat the actual wheat area in Helmand (and Kandahar) Province because it may have attributed land which would have been left fallow to wheat.

Interestingly, the wheat planting survey estimates seem to be fairly consistent with GOA's 1991/92 estimates, even though the latter are thought to be "guesstimates" because the government's authority has extended only to the urban areas in recent years. The exception to this statement is Herat for which the survey estimate is much lower than the figure reported by GOA.

Assuming that the survey estimates are basically accurate, and that the difference in pre and post-war wheat area reflects the impact of the civil war on agricultural production, Herat, Ghazni and Kandahar seem to have been more affected by the war than Helmand Province.

The survey estimate of 26,000 ha under poppy in Helmand Province is substantially higher than the 3,600 ha indicated by Nathan-Berger

for the same province for 1991.¹³ The latter estimate is reported to be based on a variety of sources using undefined methodologies. The ASSP survey estimate, however, seems to be consistent with the 20,800 ha poppy area for Helmand in 1990-91 estimated by the USAID-financed Narcotics Awareness and Control Project (NACP).¹⁴ Ironically, the NACP figures are regarded as unreliable because they differ substantially from other sources.

3.4 Preliminary Wheat Production Projections for 1992/93

In this section, the survey acreage estimates are used to develop irrigated wheat production projections for 1992/93. In developing these projections, a high, medium and low case scenario is laid out for each province based on assumptions about wheat yields. The yield assumptions are in turn based on recent estimates made by the Swedish Committee for Afghanistan's (SCA), EarthSat, the GOA's Ministry of Agriculture, and ASSP.¹⁵ These estimates are shown below in Table 3.4.

The SCA's yield estimates are based on farmer interviews obtained from non-probability surveys. EarthSat uses a more sophisticated model to develop wheat yield estimates, incorporating historical data as well as current meteorological information on variables such as rainfall and temperature. The GOA yield statistics seem to be "guesstimates" derived from reports by agricultural officials. The highest yields for the surveyed provinces are reported by the SCA and the lowest by the GOA. Some of the SCA estimates seem implausibly high.

For the wheat production projections, the high yield case is largely based on EarthSats's estimates for 1991, the medium case on GOA 1992 estimates, and the low case on the ASSP 1992 wheat production survey for Balkh and Jawzjan Province.

¹³ "Opium Subsector Survey". Draft Final Report. Nathan Associates Inc. and Louis Berger International Inc. August 1992. p.18.

¹⁴ Ibid. p.23.

¹⁵ The ASSP estimates are actually for Balkh and Jawzjan Provinces, and are based on the crop cut results of an earlier survey for those provinces. For 1992, ASSP estimated the irrigated yield as 1.28 metric ton per hectare for Balkh and 1.16 for Jawzjan.

TABLE 3.4 IRRIGATED WHEAT YIELDS - SELECTED PROVINCES, AFGHANISTAN

	(metric tons per hectare)			
	Helmand	Kandahar	Ghazni	Herat
Swedish Committee for Afghanistan [1]				
1988	1.99	1.74	1.72	2.05
1989	2.27	1.36	1.75	na
1990	1.85	1.89	2.10	3.04
1991	2.52	1.36	1.89	1.82
Average (1988-91)	2.16	1.59	1.87	2.30
EarthSat [2]				
Base	1.71	1.65	1.48	1.67
Forecast 1991	1.80	1.82	1.55	1.59
Government of Afghanistan, 1992 [3]	1.56	1.44	1.23	1.33

[1] "The Agricultural Survey of Afghanistan", SCA, various reports.

[2] "Final Report: Summary of Developments for Cropcast 1990 Afghanistan Wheat Production Assessment" Earth Satellite Corporation, 1991.

[3] Unpublished statistics obtained from the Ministry of Agriculture, GOA, Kabul.

Source: DAI/ASSP

Table 3.5 shows the yield assumptions used and the resulting production projections from the survey area estimates for each province. Irrigated wheat production is projected to range from 91,984 MT to 128,777 MT in Helmand Province, 49,040 MT to 68,666 MT in Kandahar, 39,533 MT to 52,738 MT in Ghazni, and from 62,526 MT to 83,368 MT in Herat.

Except for Helmand Province, the wheat production projections are considerably lower than previous estimates made for these provinces by EarthSat. The 1992/93 projections seem to be generally in line with the Nathan Berger estimates for Kandahar and Helmand Provinces, but not for Ghazni and Herat where the former are much lower.¹⁶ The projections also appear to be consistent with GOA wheat production statistics for 1992 with the exception of Herat where the projection is again lower.

Two points need to be kept in mind about these projections. First, for Ghazni and Herat Provinces, they represent the lower bound of irrigated wheat production since they exclude spring planted irrigated wheat, and possibly irrigated wheat in "rainfed" classified areas. Second, in other provinces such as Helmand and Kandahar they reflect a mix of actual area planted and farmers

¹⁶ The Nathan Berger estimates are based on a Lotus 1-2-3 spreadsheet model called AFGRAIN which integrates farm production data from SCA's non-probability surveys with estimates of in-country population.

intention to plant. To the extent that the latter is not realized, the projections would tend to overestimate the 1992/93 irrigated wheat production for those provinces.

TABLE 3.5 IRRIGATED WHEAT PRODUCTION PROJECTIONS 1992/93 - SELECTED PROVINCES, AFGHANISTAN

	Helmand	Kandahar	Ghazni	Herat
Irrigated wheat area (hectares) [1]	73,587	44,573	32,961	52,105
Yield (metric tons per hectare) [2]				
High	1.75	1.75	1.60	1.60
Medium	1.50	1.50	1.40	1.40
Low	1.25	1.25	1.20	1.20
Wheat Production (metric tons)				
High	128,777	78,003	52,738	83,368
Medium	110,381	66,860	46,145	72,947
Low	91,984	55,716	39,553	62,526
Other Wheat Production Estimates (metric tons)				
EarthSat, 1990 [3]	124,356	192,953	250,505	200,010
Nathan Berger, 1989 [4]	73,000	87,000	227,000	129,000
Government of Afghanistan, 1992 [5]	81,000	72,000	38,000	137,000

[1] Wheat Planting Survey estimate.

[2] Based on past yield estimates reported by the Swedish Committee for Afghanistan, EarthSat, the Government of Afghanistan, and ASSP.

[3] "Final Report: Summary of Developments for Cropcast 1990 Afghanistan Wheat Production Assessment", Earth Satellite Corporation, 1991.

[4] "AFGRAIN - Afghanistan Regional Foodgrain Situation", Nathan Associates Inc. and Louis Berger International Inc., 1990.

[5] Unpublished estimates obtained from GOA, Kabul.

Source: DAI/ASSP

4. CONCLUSIONS AND ISSUES

4.1 Wheat Area Estimates and Production Projections

Because the survey was limited to four provinces and irrigated areas, it is not possible to project 1992/93 national wheat acreage (or production) with any reasonable degree of confidence. Provincial irrigated wheat area estimates have been made, although since no statistics based on a comparable methodology are available, it is difficult to infer whether area under wheat for 1992/93 is higher or lower than in recent years.

Wheat accounts for between one-fourth to one-third of the satellite imagery defined irrigated agricultural area with the exception of Kandahar Province, where the proportion of wheat to total area is lower. Further, wheat accounts for between 50-65% of the total crop

area in all provinces except Herat where the proportion is much higher.

A comparison with other estimates suggests that, with the exception of Helmand Province, the irrigated wheat area for 1992/93 is lower than what it was in pre-war years, and substantially lower than recent estimates obtained from satellite imagery.

Preliminary projections of irrigated wheat production have also been made for each province. These projections are extremely tentative because they depend upon uncertain assumptions about yields per unit of land.

4.2 Accuracy of Estimates

With the exception of Kandahar Province, the survey wheat area estimates are more accurate in terms of relative sampling errors than the 1992 wheat production estimates for Balkh and Jawzjan Provinces. This is because the surveyors completed more observations per province than in the earlier survey. However, the non-sampling errors may be higher for the wheat planting survey because many samples were based on a combination of observation and interview which could have biased the estimates. Also, the coverage of surveyed provinces was incomplete due to the approach taken in numbering the sample points, and because the surveyors could not cover specific areas where security was poor.

Despite these limitations, the survey demonstrates that the methodology to estimate crop area is practical in the unique set of circumstances that exist in Afghanistan. This methodology can provide objective and reliable estimates of crop area (and production when combined with crop cut samples) with a relatively modest outlay of resources.

4.3 Timing of Wheat Planting Survey

The appropriate timing for a wheat planting survey poses a dilemma. If the survey is done in the fall three consequences ensue: First, rainfed areas cannot be surveyed since most non-irrigated wheat is planted during the early part of the following year. Second, the survey cannot capture spring planted irrigated wheat which exists at higher elevations. Third, one runs the risk, as experienced in this survey, that the winter wheat crop may not yet have been planted. As a result, the survey has to rely on a methodology which mixes direct observation with farmer interviews leading to possible biases and estimates which more accurately reflect planting plans as well as actual crop area. Also, it causes definitional problems relating to land use categories such as "fallow" since the latter is difficult to define or identify precisely when no crop has been sown. On the other hand, the onset of winter makes it difficult to

delay the survey any later than early December because snow and rain make many parts of the country inaccessible.

A better alternative may be to carry out the survey after the spring planted irrigated and rainfed wheat has been sown. Because of the long winter season in Afghanistan, the earliest this can be considered in many provinces is perhaps March. This implies that the advantage in terms of advance information, compared to a wheat production survey in June, is reduced to three months - with the results for the planting survey becoming available in May rather than August for the production survey. The production survey also has the benefit that it can obtain reliable information on wheat yields because the crop has either matured or is near maturity.

The three month time advantage, even though fairly small, seems important enough to warrant such a wheat planting survey to be carried out. May is the beginning of the wheat harvest season in Afghanistan which extends until September, and a March/April wheat survey would provide additional time for GOA and donors to programme imports and food assistance.

4.4 Improving Survey Methodology and Procedures

The experience gained in executing the wheat survey suggests a number of areas to which greater attention should be given to improve the survey methodology and procedures, and, hence the quality of the estimates. These include training of surveyors, field supervision and communication, and specification of contingency points.

Although, the surveyors were given intensive training in GPS use and survey methods, the training did not fully anticipate the problems they eventually faced in the field. Most of these problems resulted from the timing of the survey which was too early in many provinces. In particular, the failure during training to standardize and explain the terminology to be used for non-crop land use categories, resulted in inconsistent interpretation and classification of such categories by the surveyors.

The lack of radio communication facilities between the field supervisors and the head office, and the supervisors and the survey teams, created a number of difficulties. The most important of which was the inability to respond immediately to logistic and methodology problems as they arose during the implementation of the survey. The availability of radio communications would considerably facilitate more effective supervision of surveyors. Improvements in communication and supervision notwithstanding, the survey methodology requires a trained and dedicated team of surveyors.

The specification of the contingency points was, in retrospect, a mistake. Even though, the points themselves were randomly selected

and the procedure for substituting them for the original sample points clearly laid out, their very existence raised the possibility that surveyors would tend to choose sample points which were easier to reach. Examination of the completed points did not indicate any deviation from specified procedures except in a few instances. However, it is recommended that contingency points should not be provided in future surveys. The sample size itself can be increased to ensure that a sufficient number of observations are completed for each province.