Adoption of winter-sown chickpea in Syria: 1989/90 season

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FRMP Annual Report for 1990 pages 202-234

5.1.1 Advantage of winter chickpea varieties

The first winter-sown chickpea variety in Syria, Ghab 1, was released in 1982. It was followed by a second variety, Ghab 2, in 1986. Both varieties offer the potential of considerably increasing national chickpea productivity. The Syrian local chickpea variety is traditionally sown in the spring because it is susceptible to Ascochyta blight, a disease which is promoted by humid and moderately cold conditions. Although spring planting allows escape from conditions most conducive to blight development, late planting also means that the reproductive stage of spring chickpea falls at a time when rainfall is minimal and temperatures are high (ICARDA 1987). Consequently, yields are low and unstable.

The new winter-sown varieties were developed to be resistant to both ascochyta blight and cold. In over ten years of scientific trials, both on-station and on-farm, winter-sown chickpeas have consistently out-yielded the local spring-sown cultivars. The yield difference is usually between 50% and 100% (ICARDA 1987). The higher yields are due to a longer growing season; better utilization of moisture during growth and maturation; a higher germination rate; more favorable soil moisture and temperature conditions during reproductive growth; better modulation; and less damage from insect pests (ICARDA, 1981).

Advancing the planting date of chickpeas by as much as four months in Syria's Mediterranean climate has the obvious advantage of giving the crop an opportunity to receive more precipitation. Generally speaking, the rains begin in October and continue until February-March, when they become markedly less frequent. The rainy season ends in the spring, and it is not unusual to experience late-season droughts and high temperatures. However, there are dangers inherent in winter sowing. Ascochyta is an ever-present threat, but killing frosts can occur as well. Syria's highly variable rainfall pattern produces some years in which a good start in October-November is followed by an absence of rain in December-January, sometimes continuing longer. In such years, winter-sown chickpeas would germinate and emerge, only to die or fail to mature due to the mid-season drought.

The Syrian and ICARDA scientists who developed the new varieties were well aware of these climatic problems, and therefore breeding and agronomic research stressed the importance of resistance to blight and cold tolerance, together with cultural practices to reduce the risks of variable rainfall within a season. It was clearly recognized that weather factors, no matter how carefully they may be anticipated, cannot be completely overcome. Nonetheless, research bas proven that over a multi-year period the new varieties should out-perform the local spring chickpeas considerably, both in terms of yield and economic return.

Concurrently with agronomic trials, winter-sown chickpeas were assessed for economic feasibility using partial budgeting techniques. Careful records of variable costs were kept and these were compared to those for spring chickpea. In each year that this was done, the net return from winter chickpeas was substantially higher than for the local spring variety, although the actual difference varied somewhat from year to year and from location to location. For example, in 1985/86, a year of average rainfall but spring drought, winter chickpea gave average net revenue 68% higher than spring chickpea. In 1988/89, a year of drought, the winter varieties averaged net revenues 48% higher. The differences in income benefits were due largely to yield differences. Production costs were much the same for both types, but with one important exception. Weeds that emerge with winter rainfall are destroyed during the tillage and planting operations of spring-sown chickpeas, but producers of winter-sown varieties must somehow control weed infestations within the growing crop. Since this is usually done by hand, costs for weed control in winter chickpea are typically two to three times higher than for spring chickpea. These additional production costs, however, were more than compensated for in terms of net revenue by the yield advantage.

With such favorable profit margins, it was thought that many farmers would want to adopt the new winter-sown varieties. A substantial increase in Syrian chickpea production could therefore be anticipated in the near future.

5.1.2 Characteristics of Syrian National Chickpea Production

According to statistics published by the Syrian Ministry of Agriculture and Agrarian Reform (MMR), spring-sown chickpeas are the country’s second most important rainfed food legume crop, following only lentil in terms of production value and area planted. This has been the case for the past twenty years. Over the sane period, the place of chickpea in terms of percentage of area planted to rainfed crops has remained relatively constant at about 2% of total annual rainfed crop area. However, because there has been a dramatic increase in the total area planted to rainfed crops, the trend in annual area sown to chickpea shows an increase of 60% since 1967, representing an average growth rate of 3% per annum. Annual production, however, has trended upwards at an average rate of only 1.1% per annum. Both these figures obscure the reality of significant annual variations about trend in both actual area planted and production realized (see Figures 5.1.1 and 5.1.2).

Despite the difference in units of measurement, the patterns of variation in production and area shown in Figures 5.1.1 and 5.1.2 are remarkably similar. With one exception (i.e. 1973) the variations are the same in direction, if not in magnitude. Production figures are the product of area and yield. The latter is shown in Figure 5.1.3. In general, the pattern is similar. There are considerable annual variations in yield, but there are more differences in the directions of variation about the trend when yield is compared to production than when area and production are compared to each other. In contrast to area aid production, yield is trending downward at an average rate of -1.29% per annum. Thus, although there has been a noticeable trend towards increasing area planted to chickpea, the trend in increased production is less noticeable due to the downward trend in yield. It was initially to reverse this downward trend that the new winter varieties were developed.

Much of the annual variation in chickpea yields, and perhaps the longer-term downward trend, might be attributed to rainfall patterns. For example, a 1979 study of rainfed agriculture in Syria showed a correlation of r = 0.83 between a national annual rainfall index and chickpea yields (ICARDA 1979). Because of the earlier planting and more efficient use of available soil moisture, annual winter chickpea yields should be less subject to minor variations in rainfall than spring chickpea yields. Coefficients of variation (Cv’s) in winter-sown varieties have been lower than in spring-sown checks in agronomic trials (ICARDA 1984). Moreover, winter sowing may encourage the cultivation of chickpeas in drier areas where they are not now grown.

The relationship between rainfall and spring chickpea yields may not be unidimensional. A comparison of Cv’s of yields among rainfed crops in drier areas of Syria shows spring chickpea has the lowest (22%) among lentil (35%), barley (58%) aid wheat (37%). I)uring the sane period of comparison, the CV for precipitation was 27% (ICARDA 1979).

A comparison of CV’s of area planted and yield supports the view that rainfall has a relatively greater impact on the variability of area planted than on yield variation per se. For most rainfed winter crops, one would expect yield to vary more from year to year than area planted, because planting is done at the start of the rainy season according to the farmer's production strategy and resource availability, without knowledge of future rainfall. However, in the case of spring chickpea (c. f. Figures 5.1.1 and 5.1.3), the CV for area planted, 1967-87, is 39% while the CV for yields during this period is only 24%.

This somewhat anomalous circumstance is directly related to the place of chickpea in the rainfed farming system. Spring chickpea is largely dependent upon stored soil moisture. The decision to plant and how much to plant will depend on rainfall already received, and not, like winter planted crops, on expectations of rainfall. Yields of spring chickpea may be less variable because, in dry years, sate farmers may simply choose not to plant, thereby saving the costs of production and avoiding the risks of crop failure. The existence of this option for spring but not winter chickpea has important implications for the adoption of the winter-sown varieties, for the substitutability of winter-sown for spring-sown chickpea, and thus for the goals of reducing annual variations in area planted aid increasing national chickpea production.

5.1.3 Spring Chickpea in the farming system

Farm surveys and official government statistics indicate that chickpea continues to be overwhelmingly a rainfed crop. It was estimated in 1981 that only 5% of total production was under irrigation, and there is little indication that this figure has changed ten years later. The principal production areas fall within two of the rainfall-based agricultural stability zones established by the government. Zone 1 has a mean annual rainfall of over 350 mm aid is located along the coastal plain, the coastal mountains, aid the Jawlan plateau. It also includes a sub-zone (zone lb) to the east of the coastal range aid in the northeast corner of the country which receives mean annual rainfall of 350-600 mm and no less than 300 mm in two-thirds of the years recorded (see Map). Zone 2 is adjacent to zone 1 aid has an annual rainfall of 250-350 mm with no less than 250 mm falling during two-thirds of the years.

Both zones are characterized by the predominance of cereals and food legumes in their rainfed farming systems, although tree crops especially olives, nuts, and some fruits are becoming increasingly important. Within the two zones, there are two geographical areas which together constitute about 95% of the chickpea area. These are the Southwest, in particular the provinces of Deraa, Sweida, aid Quneitra, aid the Northwest, especially Idleb province, western Hama and Homs provinces, and western and northern Aleppo province.

Until about 1979, when there was a devastating drought in southern Syria, almost three quarters of the mean area planted to chickpea was in the southwestern region, and Deraa province (i.e. the Hauran plain) alone accounted for 43% of the national total. A study conducted before the drought SPC 1979) argued that the reasons for the imbalance between the southwest and northwest were basically economic: lower production costs and slightly higher value per 100 kg of production resulted in much higher gross margins and net earnings for southwestern producers than for their northwestern counterparts. When southwestern and northwestern producers were averaged together, the result was still “exceptionally high” gross margins aid net earnings compared to other rainfed crops (SPC 1979: III-26). Unfortunately, this study has rot been repeated, and whether chickpea continues to be such a relatively profitable crop is not known.

One reason for chickpea’s presumed profit advantage has been its place in the fanning system. Chickpea is planted in the spring as part of either a two-course or three-course rotation. Especially prevalent in the Hauran is a chickpea-wheat-fallow rotation (El-Mott 1984). More cannon in the northwest is a chickpea-summer crop- wheat rotation or, more simply, a two-course chickpea-wheat rotation. Because it is planted in the spring after the critical rainfall months of December - February have passed, the fanner can adjust chickpea planting decisions according to received rainfall. If insufficient rains have fallen to produce the fanner’s idea of an acceptable chickpea yield, then fallow can be substituted for chickpea. The costs of laid preparation, seeding, aid fertilization are therefore saved without loss. By leaving the intended chickpea field fallow, the fanner preserves the option of growing a modest summer crop (often melons) on residual moisture should heavy late rains fall in March aid April after the chickpea planting date has passed. In essence, chickpea (like a summer crop) has much lower risk in terms of crop failure or economic loss than, say, cereals which must be planted before the winter rains.

There is the additional economic advantage of low weed-control costs. Weeds can present a serious problem for winter crops because, like the crops themselves, weeds benefit from the rain falling during the winter months. Their period of greatest growth coincides with that of the winter crops. A spring chickpea producer destroys most of the winter weeds when the field is prepared for seeding, leaving only the lesser spring weeds to contend with during the chickpea growing season. This can save considerable labor costs over winter crops.

Traditional spring-sown chickpeas, although they could never supplant the dominant position held by cereals in the rainfed farming system, are a desirable crop because of the lower risk attached to planting decisions, the lower implied costs of production, aid their high utility aid market values. Like cereals, chickpeas are a consumer staple. Unlike cereals, however, their market position has remained strongly tied to local supply aid demand factors. Government intervention and international commodity market influence has been low. According to a published government report (SPC 1979), in the mid 1970’s the average price producers received was about double the announced price aid less than one percent of national production was purchased by government institutions. This situation appears to have changed in the 1980’s, probably because of substantial rises in announced prices. Chickpea can also have an important by-product value, as chickpea straw is often fed to animals.

There have been some noticeable shifts in national chickpea production patterns over the past twenty years. The rising trend in area planted with a simultaneous decline in average yields has been noted. There has been also a relative change in production areas. Annual average area planted in the southwest has fallen slightly, bit between 1971-75 and 1982-87 the average annual area in the northwest grew dramatically, with an increase over the period of 74%. At present, slightly over 37% of national chickpea area is in the northwest. More dramatically, the northeastern region, located in Hassakeh province in the trans-Euphrates Jezirah, has developed as a production area.

The reasons for the shift in emphasis away from the southwest are rot very clear, bit three factors may have been important. The first is yield performance. Average annual yields in the southwest have declined more steeply than the national average, whereas average annual yields in the northwest aid Hassakeh province have shown a fairly level trend (although with the usual considerable annual fluctuations). The second factor is mechanization. The terrain in the southwest is difficult. Situated amid ancient lava flows, the laid is rough aid full of stones. Mechanization of chickpea lard preparation, seeding, aid harvesting has not developed there as quickly as in the northwest aid, especially, the northeast. Thus, relative to the southwestern producing area, harvesting costs are often lower in the northwest aid northeast. The third factor may have been the success of a government program to replace fallow with winter crops in the southwest.

In summary, spring chickpea presents planners aid decision-makers with something of a problem. Long-term national production is almost stagnant (at an annual trend of 1.1%), bit the coefficient of variation over time is very high at 46%. Actual production has been as high as almost 64,000 tons (1981) aid as low as 11,000 tons (1979). This can be attributed mere to annual variations in area planted than to yield fluctuations, bit there is an continuous long-term declining trend in yields. The immediate reaction is to seek a way to reverse the yield trend and, while so doing, reduce the annual variations. If this can be done, then there will be obvious benefits to farmers aid the national economy.

However, there is a second problem which equally needs a solution. Variation in area planted is one of the key contributors to national production instability. Although there is a trend towards mere laid being devoted to chickpea, this is mere a reflection of the geographical expansion of the rainfed farming system than an indicator of the intensification of production aid greater utilization of resources. Lard not otherwise planted to spring chickpea, once rotational factors are accounted for, is probably either being fallowed until the next winter season or being held in "temporary" fallow to see if enough rain will fall in the spring to grow a modest summer crop.

For planners, consumers, aid economists alike, the problem of annual chickpea area presents a real challenge. Bit at the farm level, it may not be viewed as a problem or a challenge. If the farmer is practicing the traditional wheat-based farming system, then spring chickpeas act as a desirable buffer against the risk of economic loss due to the unpredictability of the winter rains. In fact, being able to vary the area planted to spring chickpeas from year to year as a protection against loss from crop failure is one of the major benefits the crop gives the fanner. A predictable yield, even if low, may be preferred to an unpredictable yield, no matter how potentially high.

5.1.4 General Release aid Assessment of Adoption Potential

The years immediately following the release of the new varieties were devoted to a controlled seed multiplication program using private farmers under contract to the General Organization for Seed Multiplication (GOSM). The program's purpose was to accumulate sufficient seed stocks for general release of certified seed. Multiplication was done on plots of one to twelve hectares. The results were successful. Yields were high; there were no major incidences of diseases or pests, aid analyses showed high profit margins (ICARDA 1988a, 1988b, 1990). At the beginning of the 1989/90 growing season sufficient seed stocks had been accumulated, and the new seed varieties were made available for sale to the general public through GOSM. Announcements concerning the new varieties and their availability were widely disseminated through the mass media and the extension service. At the same time, the Socio-Economic Studies and Training Section of the Syrian Scientific Agricultural Research Center, together with ICARDA scientists, organized a farm-level survey to assess the performance of the new technology under farmer conditions and to obtain an evaluation from the farmers themselves of the potential for adoption and positive impact.

The sample of farmers to be surveyed was drawn from lists of farmers growing winter chickpea in the 1989/90 season provided by the Ministry and GOSM. Due to limited research resources, it was not possible to include in the sampling universe farmers who had obtained seeds outside official release channels, such as those who may have received seeds from farmers participating in past on-farm trials with the Ministry aid ICARDA. Nonetheless, the lists of farmers purchasing seeds did constitute an appropriate aid adequate starting point for establishing a baseline for evaluating the adoption process.

The sample chosen contrasted farmers on the basis of their prior experience: those growing winter chickpea for the first time in 1989/90 (67% of the sample) and those already with a year or more of previous experience (33% of the sample). This latter group contained mostly farmers who had been part of the seed multiplication program. About a third of the entire sample was also growing spring chickpea. Most of these were in the group of first year winter chickpea producers.

The sample was distributed over three provinces: Aleppo, Hama, and Hassakeh. Given limited resources, sate major areas (particularly the Southwest) had to be excluded from the initial survey. But Hassakeh was included for two reasons: first, there had been a dramatic expansion of spring chickpea here in recent years; and second, research trials indicated Hassakeh had great potential for maximizing winter chickpea performance and impact. Moreover, Ministry officials irrigated that they hoped to target Hassakeh as a new area for chickpea production in the future.

The survey questionnaire focused on five subject areas: the place of chickpea in the farming system; cultivation practices; production economics; crop performance and yield; and farmer evaluation of adoption potential. Interviewing was done following the harvest.

5.1.5 Adoption categories and Rates within the Sample

To allow discussion of factors that may either encourage or hinder the adoption and beneficial impact of winter—sown chickpea, the survey sample was divided into two basic adoption categories: adopters and non—adopters, with each category sub-divided on the basis of number of years experience growing winter chickpeas. An adopter is defined as a farmer who has had one or more years' experience with the new variety and plans to produce it again in the 1990/91 season. A non-adopter has ore or more years' experience; bat does not plan to produce the crop again. Based on the relative sizes of these categories, it is possible to establish a 1989/90 baseline for adoption rates (Table 5.1.1).

The overall ratio is 47% adopters and 53% non-adopters. Over two-thirds of the non-adopters have experience only of the 1989/90 season. About three-fifths of the adopters have just ore year's experience, but they found the new variety successful enough to plan to produce it again in the next year. By comparing first-year adopters with first-year non-adopters within the sample, the initial (or first year) adoption rate was 42% in 1989/90. In comparison, the adoption of winter-sown chickpea was sustained through the 1989/90 season by 56% of farmers with two or more years' experience after the initial year's experience is not surprising. Similarly, it is also not surprising that numbers of initial adopters abandon the crop after more than one year's experience. The challenge is to determine the reasons behind initial and sustained adoption decisions.