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Abstract: Since the resources available to research institutes are scarce, and experimentation is the most costly phase of a research program, researchers must make sure that the possible solutions to identified problems have a high chance of success. Consequently, problems should be carefully prioritized for experimentation. Factors limiting increased productivity in crop production in the Eastern Margin of Central Anatolia (EMCA) along with agro-ecological factors, apart from political concern, are agronomic constraints. Limiting factors in livestock production are insufficient feed supply, poor conditions of natural grazing areas, and housing of animals. Increasing the adoption rate of the recommended production practices among farmers in the region could increase the productivity. A substantial location specific research program is also needed.

Tarımsal Araştırmalarda Problem Tanımlama ve Öncelik Tesbiti: Orta Anadolu'nun Doğusundan Bir Örnek

Özet: Araştırmacıların üretici problemlerine ürettikleri çözümlerin uygulamada başarı oranlarının yüksek olması zorunludur. Çünkü araştırma enstitülerinin kaynakları sınırlıdır ve denemeler araştırma proğramlarının en masraflı bölümünü oluştururlar. Dolayısiyle araştırma programlarının çok dikkatle önceliklendirilmeleri gerekmektedir. Orta Anadolunun Doğu'sunda bitkisel üretimde verimliliği sınırlayan önemli faktörler, ekolojik faktörlerin yanısıra agronomik sınırlılıklardır. Hayvancılıkta sınırlayıcı faktörler ise yetersiz yem arzı, mer'a alanlarının durumlarının kötü olması ve barınmadır. Tavsiye edilen tekniklerin kabullenilmesinin hızlandırılması verimliliği artırabilecektir. Ayrıca bölgeye özel araştırmalar da gerekli görünmektedir.

Introduction

The development of small-farm agriculture has attracted a great deal of interest worldwide. It is especially important for the developing countries where farms are too small for the efficient performance of agricultural activities. As Tripp (1991) stated, "The challenge of making small farm agriculture more efficient is difficult, especially because it depends on improving production from a large number of farms operating under a wide range of conditions, constraints and objectives. This task is shared by many people, including farmers, policy makers and academics, but an important part of the burden falls on agricultural researchers and extension agents " (1).

The conventional "top-down" approach to developing small-farm household systems on a sustainable basis is formulated with little or no consultation at the farm level and without determining existing constraints and development potential. Therefore, there is currently a big gap between what is known and what can be done, and what is actually practiced by farmers. There is a need for an integrated effort among all disciplines and government agencies to remove the constraints that now exist. This calls for an effective systems approach (a system that includes farmers, researchers and extension agents) to resolve this production gap problem.

Farms in the Eastern Margin of Central Anatolia have substantially lower grain yields of major crops compared to other areas on the Anatolian highlands. Therefore, this study focuses on investigating factors that limit production in the two provinces of (Kayseri and Sivas) of EMCA with the objective of setting priority for experimentation that are conducted in fields, forwarding problems to extension services and to policy makers. Since research institutes have limited resources and farmers prefer to consider recommendations that address

important problems, setting the priorities for research is an important component of research programs. Consequently the objective of this study is to prioritize the research problems for the EMCA for use by the Central Research Institute for Field Crops (CRIFC), which is responsible for this area.

The rationale for selecting the study area is as follows: firstly, CRIFC's mandated region includes the target area. A number of experiments have been carried out in this area, but these are negligible in comparison to studies conducted in the western part of the country where most agricultural research centers are located, and research staff are concentrated. This proportionally reduced research effort may be one factor contributing to the ongoing Low productivity and living standards of farmers in Eastern Anatolia. Another issue is the fact that research problems have been selected without adequate field validation of their likely productive or economic importance in the past. Also, the target area has been selected because the gap between actual and potential yield appears to be large, and farmer's yields are low when compared with the national average and the central Anatolian average levels (2). Raising yields in Kayseri and Sivas substantially would have a major impact nationally, since these two provinces constitute 24 percent of the wheat area in central Anatolia and 9 percent of the wheat area in Türkiye as a whole.

Substantial yield increases are possible in the target highlands. Previous Turkish successes in raising farmer yields were based on a program integrating adaptive agronomic research with strong extension efforts. These were to provide farmers with new varieties and improved agronomic practices well adapted to the environmental stresses of the highland areas. Substantial progress has been made through farmer's adoption of improved technological packages in Central and Western Anatolia. However, despite these efforts, there has been little progress in the less researched areas of eastern Anatolia (3).

Methodology

The study focused on farm-level data collection and analysis including objective, qualitative data on the socio-economic structure of households and farms, farm parameters, enterprise patterns, production practices, technical production problems, marketing and consumption patterns. In consideration of the characteristics of the target area, both quantitative and qualitative open-ended questions were used to gather such data from the farmers.

There are 10 districts in the study area, seven of which are in Sivas province. These 10 districts have 779 villages, and 56, 040 households (4). A total of 62 randomly selected villages (35 in the informal survey and 27 in the formal survey) were visited to determine whether or not the population was homogenous. The study area and its population appear to be largely homogenous in terms of climate, soil type, crop pattern, cultivation practices, family composition, institutional support, family size, land tenure, capital assets and existing technology. The total sample size was 207 farmers. The sample size was kept high so that variations between households could be recorded.

The diagnostic data were used to describe the circumstances and practices of representative farmers to identify problems limiting the productivity of the resources available to farmers, understand the causes of these problems, and to consider possible solutions.

The methodology used to prioritise the problems was adapted from Tripp and Woolley (5). The method is based on a series of steps, corresponding to the distinctions between problems, causes, and solutions. Step 1 is for identification of the problems. In Step 2, a rough order of priority is assigned to each problem according to the number of farmers affected, the importance of the crops, and the seriousness of the problem. Step 3 involves identifying the causes of the problems. Therefore, possible solutions will be sought to each problem for which there is sufficient evidence in step 4. The possible solutions given in step 4 are evaluated according to the following criteria: 1. Probability that the technology will function, 2. Profitability, 3. Compatibility with the farming system, 4. Contribution to reducing risk, 5. Need for institutional support, 6. Ease of testing by farmers, and 7. Ease of carrying out the experimental program. And finally, the list of possible solutions is narrowed by evaluating each one for potential benefit, ease of adoption by farmers, and ease of investigation in step 5.

Results and Discussions

The research area is located at the EMCA at an elevation of over 1,200 meters. The population is overwhelmingly rural and most of the people are engaged in small-scale agricultural enterprises (4). In comparison to other parts of Türkiye, this area contains a disproportionately large percentage of disadvantaged farmers, and yields are substantially lower than those in other western provinces of Cental Anatolia (CA). Topography is dominated by mountain ridges, interspersed with valleys of varying degrees of slope and

width. It is in the valley and long plateau (Uzun Yayla) area where agriculture, especially with wheat, at 63% or 8 ha on average, and chickpea, at 12% or 1.5 ha on average, is principally practiced. Dry farming systems are predominant, irrigation being restricted to small areas along the rivers and banks (6, 7).

The dominant Great Soil Groups are Brown types, covering about 75 percent of the sown area and poor in organic matter content. The region is characterised by severe drought in summer combined with extreme temperatures in summer and winter. Agricultural production is largely determined by the severity of abiotic stresses. The winter is long and cold, the region is covered by snow for about five months, and summer is hot and dry. The annual average rainfall is between 344 and 540 mm (8). Thus, the growing season is relatively short.

The major group of factors limiting increased yield along with agro-ecology, are agronomic constraints. The most common issues in poor agronomy encountered in the region are inadequate tillage and seed-bed preparation, inappropriate fertiliser application rates and types, use of varieties with low yield potential and poor environmental adaptation, and insufficient weed, insect, and fungal disease control (Table 1).

Varietal adaptation is also an important issue in the region. Köse 220/39, a very old variety (released approximately 50 years ago), still accounts for 52% of the sown area. It is preferred because it is good for making bread and has a high cold tolerance. Two other improved varieties, Bezostaya and Gerek-79 (dominant in Central Anatolia), are grown on 20 and 16% of the sown area, respectively. Soil moisture availability, frost and heat, especially during the flowering of plants, are important factors limiting varietal adaptation locally. Introduction of more modern, improved and adapted varieties may be an element in increasing the farmers' economic performance.

Seed fumigation of grain in store was an infrequent practice for the control of storage pests. Seeds are usually chemically treated before planting. Herbicide use was comparatively rare. The importance of fertilizer use is well known by the majority of farmers, but they are unclear on appropriate rates and means of application. Fertilizer use differs from farmer to farmer, depending on their financial situation and farming ability.

It is evident from the information in the Table 1 that poor agronomic management in food legume production is a primary cause of low yields. Though their importance in household diets is generally recognized, food legumes receive disproportionately less attention in local farming systems than cereals. There was a common belief among farmers that legumes do not respond to fertilizer, but they could not explain why. Therefore, no farmers used any fertilizer. Some of the farmers fumigated the seeds before planting to guard against insect attack.

Livestock in the region plays an important role in the farming system. However, a smaller share of agricultural income is derived from animal and animal product because the livestock production is not well integrated with crop production. Livestock should be better integrated in the farming system in the region both nutrition and the income level of the farmers, and should be given a higher priority in research and policy formulation.

Turkish agriculture has changed at the expense of a major reduction in land previously under permanent pasture and ranges. This has resulted in an imbalance between crop production, mainly cereal and food legumes, and livestock production. The situation of communally owned natural pasturs and meadows which are too steep, stony or shallow for cultivation, has steadily deteriorated with an increase in the number of livestock, especially sheep. The current "free for all in the village" approach to grazing rights on village pastures and ranges has brought about severe long-term overgrazing and consequently permanent reduction in the livestock carrying capacity of grazing land. Unfortunately, the potential productivity of the livestock sector has not been realised, as a result of inadequate feed supply in particular. The physical condition of farm barns is also an important constraint. Barns are poorly ventilated, and poor hygiene practices are the norm, and therefore increase diseases.

Pastures usually occur at the foothills and on the slops of mountain ranges and perennial vegetation with a low productivity is severely degraded through overgrazing. Cereal stubble and other crop residuals are important sources of feed for livestock during summer and fall. Livestock feed in the winter comes from grain, straw and concentrates. Barley could be substituted for wheat, and further forage legume and fodder crop production should be encouraged to help provide additional animal feed resources from current production. In addition, increasing the capacity of local milling industry would be useful.

The priorities of the identified problems were ranked according to three criteria: (a) distribution of the problem, (b) the importance of the particular crop enterprise to the farming system, and (c) loss of yield or

Table 1. Prodblems.

Problem		Evidence available	Additional evidence required
1.	Low wheat, chickpea and lentil yield	Experimental results Farmer interview	No more evidence required
2.	Poor seed bed preparation	Experimental results Farmer interview	No more evidence required
3.	Hot summer winds	Farmer interview	Field observation, Review of Meteorologic reports
4.	Cold winter	Farmer interview	Further experiments
5.	Variety	Survey results, observations	No more evidence required
6.	Insufficient weed control in legume production	Farmer interview High labor cost	More observation, Farmer interview
7.	Ascochyta	Experimental results Farmer interview	No more evidence required
8.	Input use	Experimental results Farmer interview	Soil analysis More observation
9.	Low carrying capacity in natural grazing areas, low plant population density	Farmer interview	More observation
10.	Insufficient feed supply and animal feeding, low milk yield	Farmer interview	No more evidence required
11.	Manufactured feed	Farmer interview	Manufactured feed analysis
12.	Land fragmentation	Farmer interview	No more evidence required

income for which the problem is responsible. Results are presented in Table 2. Seven problems received primary and equal priority: low yields of wheat, chickpea, and barley; hot summer winds; Ascochita for chickpea, input use, low carrying capacity in rangelands; insufficient feed supply and low milk yield, and land fragmentation. Problems 2, 4, 5 and 11 were assigned second priority whilst problem 6 received third priority.

For the determination of sensible possible solutions to problems, the causes of the problems should be carefully analysed. The causes of the problems identified in Table 1 are presented in Table 3. Some of the problems have more then one cause, while others have only one or two. Problem 1, for example, has as many as eight causes, whereas problems 3 and 4 have only one each. Sometimes two problems are related to each other. For example, problems 2, 3, and 4 are causes of problem 1.

Possible solutions to the problems are identified in step 4 of the procedure. Results are presented in Table 4. As indicated, some of the solutions are forwarded to research (R), some to extension (E), and some to policy makers (P). Some of the solutions are dealt with by more then one institution. This indicates the importance of an effort by a multi-disciplinary and multi institutional team and the links between the sub-groups of researchers, extension agents and farmers to determine and solve the problems of small farmers in the region. Some solutions are already being made available by CRIFC. Proper seedbed preparation, for example, is a finding of a research program that can easily be transferred to and used in collaboration with research institutes, extension services, and farmers. The solution is then only to modify and disseminate these improved research findings to farmers with the support of appropriate incentives.

Some of the problems are socio-economical in nature, and thus require decisions by policy-makers. Research institutes and extension services can only help implement these decisions. Land fragmentation, for example, is one such problem.

Table 2. Prodblems Ranking.

Problem		Distribution of problem	Importance of crop enterprise	Seriousness of problems	Relative importance of problems
1.	Low wheat, chickpea and lentil yield	Most of the farmers (XX)	Cereal and food legumes (XX)	(XX)	1
2.	Poor seed bed preparation	Half of the farmers (X)	Cereal and food legumes (XX)	(XX)	2
3.	Hot summer winds	Most of the farmers (XX)	Wheat (XX)	(XX)	1
4.	Cold winter	Most of the farmers (XX)	Wheat (XX)	(X)	2
5.	Variety	Half of the farmers (X)	Cereal and food legumes (XX)	(XX)	2
6.	Insufficient weed control in legume production	Half of the farmers (X)	Food legumes (XX)	(X)	3
7.	Ascochyta	Most of the farmers (XX)	Chickpea (XX)	(XX)	1
8.	Input use	Most of the farmers (XX)	Cereal and food legumes (XX)	(XX)	1
9.	Low carrying capacity in natural grazing areas, low plant population density	The whole region (XX)	Natural grazing areas (XX)	(XX)	1
10.	Insufficient feed supply and animal feeding, low milk yield	Most of the farmers (XX)	Livestock production (XX)	(XX)	1
11.	Manufactured feed	Most of the farmers (XX)	Livestock production (XX)	(XX)	2
12.	Land fragmentation	Most of the farmers (XX)	All farming system (XX)	(XX)	1

XX: Very important, X: Somewhat important, 0: Not important

An exercise in the evaluation of possible solutions was done (Table 5). Criteria, the probability that technology will function and profitability are most crucial if there is enough evidence. A proposed solution should not be evaluated if it does not function or is not profitable. Criteria 3, 4, and 5 are also quite important. If a solution appears to be incompatible with the farming system, increase risk for farmers, or require too much institutional support, it should not be adopted. Criteria 6 and 7, although not as important, do require some consideration along with the criteria. In general, the chances of the possible solutions evaluated resolving the problems identified are high. This requires more consideration and perhaps more field work and analysis.

Conclusions

Much of the difficulty in adopting newly developed technologies and increasing the grain yields in the EMCA stems from the fact that researchers and extension agents have not worked together to ensure that researchers ask appropriate questions and extension agents are not provided with relevant research results. Increasing the average grain yields of the major crops grown in the EMCA seems very possible by increasing the adoption rate of recommended production practices among farmers. Specific regional development policies are required to remove the existing inequities in opportunities for advancement and the standard of the living of rural communities.

Table 3. Analysis of the Causes of the Problems.

Causes	Problems
Insufficient variety for the region Long and cold winter Hot summear wind Use of marginal land Poor and untimely seed bed preporation Insufficient agronomic practices Late planting Input unavailability when needed	1. Low wheat, chickpea and lentil yield
Lack of knowledge Custom hiring Animal feeding/late fallow	2. Poor seed bed preparation
Climatic factors	3. Hot summer wind 4. Cold winter
Ineffective extension of new varieties New varieties are not preferred for bread making Insufficient local specific research activities	5. Variety
Hand weeding Expensive chemical	6. Insufficient weed control in legume production
Local varieties Insufficient tolerant variety Chemical control	7. Ascochyta
Lack of knowledge	8. Input use
Heavy grazing Communally owned grazing areas Uncontrolled grazing No measures are taken for improvement	9. Low carrying capacity in natural grazing areas, low plant population density
Low carrying capacity Lack of knowledge Insufficient natural grazing areas Fodder crop production Expensive manufactured feed Bed housing conditions Lack of green grazing	10. Insufficient feed supply and animal feeding, low milk yield
No control by authorities	11. Manufactured feed
Heritage law High population density	12. Land fragmentation

The crop pattern in the EMCA is dominated by cereals, with 82 percent of the total sown area. Farmers must be educated to appreciate that there are crops in addition to wheat. The sown area of food legumes and fodder crops could potentially be expanded.

Current farmer production practices are another area of potential intervention. The adoption of recommended production practices would likely result in an increase in production. The reduction of seed rates without diminishing stand densities, for example, could increase

Table 4. Possible Solutions to Problems

Problems	Possible solutions
1. Low wheat, chickpea and lentil yield	a) Adaptation trails, research on variety (R) b) Proper seed bed proportion (R, E) c) Timely sowing (R, E) d) Appropriate and timely fertiliser application (R. E) e) Withdrawing production from marginal areas (E, P)
2. Poor seed bed preparation	a) Farmers training (E) b) Timely fallow (R, E)
3. Hot summer wind	a) Early and/or late maturing variety (R, E)
4. Cold winter	a) Tolerant variety (R, E)
5. Variety	a) Local specific variety development (R) b) Adaptation trials and extension (R, E)
6. Insufficient weed control in legume production	a) Chemical control (R, E) b) Agronomic practices (R, E)
7. Ascochyta	a) Tolerant variety (R, E)
8. Input use	a) Farmers training (E)
9. Low carrying capacity in natural grazing areas, low plant population density	a) Improvment projects (P) b) Controlled grazing (P, E)
10. Insufficient feed supply and animal feeding, low milk yield	a) Farmers training (E) b) Fodder crop production incentive (P, E) c) Artificial pasture establishment (R, E., P)
11. Manufactured feed	a) Increasing the content (P) b) Control of milling plant (P)
12. Land fragmentation	a) Policy option (P)

(R) Research, (E) Extension, (P) Policy markers

Table 5. Evaluation of Possible Solutions

Possible solution	1. Probability that technology would function 1/	2. Profitability2/	3. Compatibility with system	4. Contributing to reducing risk	5. Institutional support		6. Ease of testing by farmers	7. Ease of carrying out experiments
					Extension	Input		
1.a.	H	H	H	M	X	X	H	H
b.	H	H	H	H	X		H	H
c.	H	H	H	H	X	X	H	H
2.a.	M	H	H	H	X	X	H	H
b.	H	?	L	H	X		H	H
3.a.	H	H	H	?	X		H	H
4.a.	M	?	?	?	X	X	H	H
5.a.	H	H	H	H	X	X	H	H
b.	M	?	?	?	X	X	H	H
6.a.	H	?	H	H	X	X	M	H
b.	H	?	H	H	X		M	H
7.a.	H	H	H	H	X		L	H
8.a.	L	H	H	H	X		L	H
9.a.	L	H	L	H	X		L	L
b.	L	?	H	H	X		H	L
10.a	M	H	H	H	X		H	H
b.	M	H	H	H	X		H	H
c.	L	H	L	H	X		H	
11.a.	H	H	H	H				
b.	L	L	H	?				
12.a.	H	H	H	H				

1/H: High, M: Medium, L: Low; 2) ?: Results of the solution unclear.

farmers' income considerably. Farmers should be encouraged and motivated to use appropriate new varieties, which in turn should be made more widely available.

Effective evaluation of crop-livestock interaction is crucial in the region. This issue begs for research attention. As the natural grazing areas are heavily overgrazed, crop green stage grazing could be an important intervention if managed effectively.

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References

1. Tripp, R., The Farming Systems Research Movement and On-Farm Research. In Planned Changes in Farming Systems: Progress in On-Farm Research (Ed. R. Tripp). New York, John Wiley & Sons, 3-17, (1991).
2. Mizrak, G., Durutan, N., Atli, A., Dutlu. C., and Bostanci, V., Summary of Wheat Research Activities in Turkiye. Central Research Institute for Field Crop, Ankara, 37, (1986).
3. Keatinge, J.D.H., Agricultural Change in Turkey 1947-87: A Suitable Example for Sustainable and Equitable Development in Dryland Agriculture for West Asia and North Africa? MEDIT. Agriculture, Ecosystems and Environment, 2, 19-21, (1993).
4. SIS, Census of Population. Administrative Division. Turkiye. Turkish Republic, Prime Ministry, State Institute of Statistics. No: 1457, Ankara, 648, (1991).
5. Tripp, R., and Woolly, J., The Planning Stage of On-Farm Research: Identifying Factors for Experimentation. CIMMYT and CIAT, Mexico, D.F., and Cali, Colombia, 85, (1989).
6. Anonymous, Kayseri Yli Envanteri. Kayseri İl Müdürlüğü, Kayseri, 88, (1990).
7. Anonymous, Sivas Yli Beş Yıllık Tarımsal Kalkınma Planı. Sivas İl Müdürlüğü, Sivas, 111, (1991).
8. Anonymous, Uzun Dönem Ortalama ve Ekstrem Sıcaklık ve Yağışlar. Devlet Meteoroloji İşleri Genel Müdürlüğü, Ankara, 678, (1984).