1

FARMSOFT – A 1997 Agricultural Software Review Perspective

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Abstract:

Commercially available software is a practical indicator of the content and level of ICT adoption. A workgroup from eight countries - currently the Eunita WG B* has, since 1990, been reviewing agricultural software - the results were published in FARMSOFT '91 and FARMSOFT '94. This paper summarizes them and additional findings.

During this period "agricultural" software matured into an ICT dominated market-pull situation characterized by EDI, knowledge based networking and dedicated ICT production systems. During this process marked differences were found in software attributes, identified end-user needs and applications. ICT adoption in the agricultural sector itself is proving to be a non structured process - currently integrating Remote Sensing, GIS, Knowledge Systems, Robotics, Process Control and Information Dissemination - within each country's IT policies and CAP regulations. We expect these trends and the increase in installations to continue.

Key words: Agriculture, Software, Information Technology, Computers, Technological Innovation

*(Belgium, France, Germany, Israel, Italy, Portugal, Spain and The Netherlands).

1. Introduction

A workgroup from eight countries has, since 1990, monitored commercial software available to the agricultural sector. Individual countries from the group started earlier (e.g. France since 1983, Italy from 1986, etc. The results are available nationally). The workgroup's results - with a summary - and national reviews have been published first as a prototype software

catalogue FARMSOFT '91 and later as FARMSOFT '94. The period under review witnessed a significant change in the IT environment in agriculture: from batch processing of management data at a service center up to ICT based real time decision support systems in production.

The proliferation of on-farm personal computers with shared resources now enables - via networks - audio and visual dissemination of data, information and knowledge. An equally significant shift, corresponding to hardware innovation has been a graduation from a technology push to an end-user market-pull situation with computers embedded in machines, controlling processes and production, monitoring the environment and in limited cases making elementary decisions. Agricultural production now being committed to sustainability and environmentally friendly practices with CAP-dictated production policies is, in fact, ever more **dependant on ICT** and a wide range of "end users". Kamp (1995).

The software overviews reflect the differential changes and time lags as reported by each country. They portrayed the wide range of agricultural practices in the participating countries and the national organizations involved in development and adoption of "agricultural" ICT. The reported data identifies some of the general trends - which mask the differences between countries. A future report is expected to relate to these.

Gelb (1996) reviews the difficulty in **measuring** what software and their embedded knowledge contribute to the end user. Nevertheless the reported software were reviewed in workgroup discussions for content and the adoption trends were evaluated. The following comments and observations could not be the result of a formal qualitative analysis. They do represent the views expressed in the reviews and by the reviewers. Considering their vantage point makes the comments a sound basis for a comparison.The conclusions give a better understanding of ICT development and adoption which for reasons - understood and others, lag behind the potential benefit and expectations.

2. Background Information

The following summarizes the general agricultural background, software availability and commercial installations as reported by the eight countries participating in the Eunita workgroup B (Belgium, France, Germany, Israel, Italy, Portugal, Spain and The Netherlands).

An Agricultural Sector Summary

	1994	1996	CHANGE
POPULATION (million)	270	277	7
% OF FARMERS IN WORK FORCE	2-12%	2-8.7%	-3.3
CULTIVATED AREA (million Ha.)	105.715	85.344	-20.2

We note here a trend whereby cultivated area is significantly smaller as is the ratio of farmers in the work force. Other sources assert that the average farm size grew and the farmer population aged. This suggests a need for an increase in software and installations, especially in the management category (larger production units justify the investment and with experienced farmers leaving the farm some of their skills are substituted by management programs). We see this trend in Tables 1 and 2 which inventory commercially-available software and the relative weight of each category. Multiuser programs are defined as programs that support simultaneous users on the same database.

Table 1. Software Inventory (Farmsoft software count)

SOFTWARE CATEGORY	PROGRAMS 1994	1996	CHANGE	% OF THE 1996 TOTAL	NUMBER EXPORTED	MULTI-USER
MANAGEMENT	300-320	513	+ 197	39.0	11 (2%)	14
ANIMAL HUSBANDRY	280-300	335	+ 35	26.0	28 (8%)	15
CROP PRODUCTION	160-180	117	- 63	8.9	6 (5%)	10
MACHINERY AND PROCESS CONTROL	80-110	84	- 26	7.0	2 (2.4%)	
IRRIGATION	35- 50	19	- 31	0.1	1	1
OTHERS	205-220	247	+ 27	19.0	7 (2.8%)	7
TOTAL	1070-1180	1315	>135	100%	55	47

Table 2. Software Producers and Installations

INSTALLATIONS AND PRODUCERS	**INSTALLATIONS**	**SOFTWARE PRODUCERS**
TOTAL 1996	385900	422
1994	220 000 - 240 000	330 - 380
CHANGE	**+ 146 000**	**+ 42**

Since FARMSOFT '94 there is a marked increase in **officially** reported software installations from 240 to 385000. This is a **major underestimate** since not all installations are reported and they do not include the many useful "home made - spreadsheet" applications and very small "one person" companies tailored products. From other sources we know that animal husbandry in some of the reviewed countries are fully computerized which means that the increase in the number of installations is dependant on the number of practicing farmers, which is decreasing while the size of the production unit is increasing. However if we note that at least 2% of the eight countries' reported population are farmers we can see that the potential for computer utilization, and needs, are extremely large - if not for more software at least for more installations. This assumption is supported by the modest increase in the number of commercial software producers - which does not detail the exit and entry of new producers nor their reasons.

Since the benefit potential from ICT adoption is commonly accepted and on-farm computers prevalent the first question that arises from these results is why is adoption rate so slow (142000 over two years). We note that the largest number of programs and the largest increase of program numbers are in the management category. This is explained in part by CAP requirements, tax regulations and the availability of on farm management programs. Despite the availability of such programs and a high degree of record keeping and report standardization we did not identify a corresponding reduction of computerized services for farmers in this category. These services include preparation of tax returns, CAP dictated reports, balance sheets, investment schedules, ration preparations, etc. In three countries at

least we were informed of an **increase** and as shown in Table 4 farmers are involved in developing these services and even providing them to others.

The explanation for the slow rate is apparently exogenous to farmer needs. The question becomes more urgent when the reported trend of integrating agricultural information services, embedded computers in production systems, online DSS and information linkages is included. All of these are currently redefining the agricultural software environment. The "others" category is also grossly underestimated because of the "commercial presence constraint" imposed on reported software. There is a large number of startup programs that have yet to be taken up - in areas detailed further on. Two trends were reported although they do not show up in the definitions of software categories:

Software availability to the agricultural sector is now characterized by a wide selection of applications - e.g. Wahl, (1995). Demand for tailor made applications (either for individual farmers or niche production) continues as does the consolidation process of software specialization - with larger software houses providing new applications, more modules and upgrades for existing programs (We do not note a significant increase in software programs). The second trend reported in these programs is an emphasis on connectivity, incorporation of climate information, better environment management, standardization of I/O devices, services and external database and user interfaces. New elements include communications, process control, information management, data acquisition and processing and computer embedded systems - see Table 3. The cumulative impact of Internet and broadband communication capabilities on software effectiveness has not yet been monitored. The reported software packages are more efficient in their performance and information exchange - see Table 1 - multiusers. In this context we note that national IT and EDI policies remain major issues - however with the agricultural sector now an end user adopting into the national ICT infrastructures.

A major shift in software development partners is reported. It reflects more cooperation in software development demonstrating more sensitivity to market requirements. Whereas joint developers such as farmers and extension; research and farmers; regions and research, etc were once the exception there is now a much higher level of cooperation. Table 4 shows that regional authorities (as different from central government) have joined the list of cooperators as well. Expected improvement in cooperation between countries in software development and marketing has yet to be realized. As shown in FARMSOFT '94 there is a knowledge component (knowledge bases, rules, formulas, recommendations, etc) in the software exported. This suggests that a knowledge component is transferable as implied in Table 1. and is a vehicle for transfer of technology e.g. herd management which is part of advanced and imported animal husbandry. Gelb (1995) shows that such benefit is measurable. We also note that the major software exports are in crop production and animal husbandry - apparently for comparable Decision Support Systems.

3. Telematic Services

A country count was made to assess the availability of the following commercial services for the agricultural sector - with a mention if these services can be found in other than the eight FARMSOFT counties. The results are presented in table 3.

Table 3. ICT Availability

	DEVELOPED	BEING DEVELOPED	N.A.	AVAILABLE ELSEWHERE
VIDEOTEX	6		2	YES
DEDICATED INTERNET		6	2	YES
EDI	6	2		YES
GIS	2	5	1	YES
EXPERT SYSTEMS	1	5	2	DEVELOPING
REMOTE SENSING	1	6	1	DEVELOPING
ROBOTICS		6	2	DEVELOPING
MULTIMEDIA	1	5	2	YES
PROCESS CONTROL	4	4		DEVELOPING

It must be noted that Table 3 is **not** a measure of technical competence but the commercial availability of a service for agricultural production - as reported in FARMSOFT.

4. ICT Policies

Six countries reported that they have a national ICT policy. Of these only three reported special ICT programs for agriculture. No country reported national standards for software either as part of national ICT policy or as a form of support for the agricultural sector. A country count of organizations involved in agricultural software development and export is detailed in Table 4. Aside from the universal involvement of research institutes in software development we note a similar pattern of development entities. Only half the countries export their software. The involvement of the associations is different in each country and the inclusion of this category is for indication purposes as is the indication of extension service involvement.

Table 4. Software Development Entities

	INVOLVED	NOT INVOLVED
FARMER ORGANIZATIONS -	6	2
ASSOCIATION OF SOFTWARE PRODUCERS	6	2
THE EXTENSION SERVICES -	4	4
RESEARCH INSTITUTES -	8	-
REGIONAL AUTHORITIES -	7	1
EXPORT OF SOFTWARE	4	4

Our attempt to interpret Tables 3 and 4 indicated that ICT adoption is a non orderly process within the agricultural sector, leapfrogging interim stages. For example adoption of internet facilities does not dictate an apprenticeship in videotex; farmer-association initiated software development does not depend on prior mainframe capabilities; etc. Table 3 shows a similarity in ICT subjects being developed in the surveyed countries which again suggests that ICT is a vehicle for technology transfer between the countries surveyed. A differentiation was not made between adoption of technological innovations to the agricultural sector and specific developments for systems such as GIS/GPS, Expert Systems, etc. Table 4 reveals an interesting pattern of public and organizational involvement - in all countries research entities are involved in ICT development and adoption (reflecting national funding) but only in four is Extension (again public sector funding) involved. It would a priori be assumed that extension be part of at least the adoption process and identified in all eight countries where regional authorities are involved in ICT at different levels. This is probably a result of farmers growing local

influence and ICT contribution to farmer ability to accesses distant market information. This raises the question of public funding for ICT development in general and in particular- why is software development **not left** to the market place. The reviews show the large market potential, we know that technically agricultural software is not unique and there is no lack of companies. We did not yet find a satisfactory explanation.

5. References

Gelb, E.M., 1996. The Economic Value of Information in an Information System. *Proceedings ICT Applications in Agriculture*. Wageningen Holland

Kamp, J.A.L.M., 1995. Overview of the Development of Western Europe's Agriculture and the use of IT. *EUNITA Workshop*, Keszthely, Hungary.

Wahl, V., 1995. Strengths and Weaknesses in the French Situation of Information Technology Applications in Agriculture. *Proceedings - Management and Transfer of Information. CECAT*, Beijing.