STAKEHOLDERS ANALYSIS

GNSS USE IN AGRICULTURE

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FOREWORD

UNIFARM sets up a user forum to present and defend the needs of agricultural users in the development of GNSS applications and services. It will also serve as a new dissemination channel to increase awareness among the large majority of farmers. To achieve this, UNIFARM brings together precision agriculture projects and farmer representatives from all over Europe. The project collects user requirements as well as user cases and presents them to policy makers in GNSS evolution and in particular to farmers, farm suppliers and representatives. Hereby UNIFARM aims at setting up a network that will persist after the end of the project.

A consortium of eight partners from five countries carries out UNIFARM: the Netherlands, Denmark, Germany, Italy and Czech Republic. The consortium includes two SME's; AeroVision (coordination) and Ekotoxa, four research partners; Technical University Dresden (TUD), German Research Centre for Artificial Intelligence (DFKI), Alterra and DISMI and two farmers organisations; Southern Agricultural and Horticultural Organization ZLTO and the Knowledge Centre for Agriculture (VFL). The project runs for two years, starting January 2012.

The stakeholder analysis will give an overview of stakeholders to the use of GNSS in Agriculture and includes both the agricultural and the space domain. The identification of stakeholders contributes to the set-up and the selection of (key) members in the user forum.

EXECUTIVE SUMMARY

Agriculture is an important economic activity in Europe. GNSS use in agriculture is taking off and becomes a relevant factor in different segments. GNSS is enabling or key technology in precision agriculture as well as in information management aspects, in particular as part of the on the spot controls on income support in the frame of the European Common Agricultural Policy.

This stakeholder analysis gives an inventory of relevant stakeholder groups and identifies different types of organisations that play a role in the GNSS use and adoption in agriculture. The identified stakeholders are ranked on a two dimensional matrix with their influence on GNSS use and adoption on one axis, and their enabling role on GNSS uptake on the other axis. This yields a quadrant with most relevant stakeholders for the GNSS use and adoption. Farmers, contractors, machine manufacturers, advisory services, Research Organisations and the European Commission are identified as the most relevant stakeholders. Additionally, several stakeholders are identified as creating a higher leverage, like the supply industry.

The relevant stakeholders are taken further in the next phase of the project where individual companies and organisations and contact persons are further identified. The UNIFARM User Forum will strive to include as much as possible the relevant stakeholders.

1 INTRODUCTION

1.1 Purpose and scope

This report describes the work done and the results of the stakeholders analysis to GNSS use in agriculture. The stakeholder analysis provides relevant insights in the organisations influencing the uptake of GNSS use in agriculture. The study therefore identifies potential participants for the UNIFARM user forum. The stakeholder analysis will cover both the SPACE and the AGRI domain and it serves as the basis for further activity.

1.2 Reader Guidance

In Chapter 2 a description of the work performed for the stakeholder analysis is presented. The analysis consists of identifying different stakeholder bodies. In Chapter 3 the results of the different analyses are presented. Chapter 4 provides conclusions of the analysis and gives recommendations to the project.

1.3 Abbreviations and Acronyms

Table 1: list of abbreviations, acronyms and terms

AET	Agricultural Engineering and Technologies
CEETTAR	European Organisation of Agricultural and Rural Contractors
CEJA	European Council of Young Farmers
DEL	Deliverable
DFKI	Deutsches Forschungszentrum für Künstliche Intelligenz / German Research Center for Artificial Intelligence
DG-AGRI	Directorate-General for Agriculture and Rural Development
DG-SANCO	Directorate-General for Health and Consumers
DISMI	Dipartimento di Scienze e Metodi dell'Ingegneria / Department of Science and Methods for Engineering, University of Modena and Reggio Emilia
DoW	Description of Work – Annex to the Grant Agreement
EC	European Commission
EGNOS	European Geostationary Navigation Overlay Service
ESA	European Space Agency
EU	European Union
FP7	European 7th Framework Program
GNSS	Global Navigation Satellite System
GSA	GNSS Supervisory Authority
IAP	Integrated Applications Promotion
JRC	Joint Research Centre

License to Operate	The implicit consent of government and society to allow companies to carry out their commercial activities with minimised regulatory interference or opposition from local communities.
SME	Small and Medium Enterprises
SotA	State of the Art – refers to the State-of-the-Art report of UNIFARM D1.6
TUD	Technische Universitaet Dresden / Technical University Dresden
VFL	Videncentret for Landbrug / Knowledge Centre for Agriculture
WP	Work Package
ZLTO	Zuidelijke Land- en Tuinbouworganisatie / Southern Agriculture and Horticulture Organization

2 DESCRIPTION OF WORK

2.1 Introduction

The aim of this study is to perform an inventory and analysis of relevant stakeholders to GNSS use in agriculture. Identified relevant stakeholders are potential members of the User Forum of GNSS use in Agriculture, which will be set-up in the frame of UNIFARM. According to the UNIFARM DoW, the User Forum will express and defend the user needs of agricultural use of GNSS technology and applications.

The stakeholders are individuals, groups, or institutions likely to be interested in or affected by the GNSS use in agriculture. Their attitude can be either negatively or positively. The stakeholder population is broad and diverse across Europe. Abstracting to stakeholder groups as well as narrowing the field to key stakeholders is a main objective of conducting a stakeholder analysis.

The stakeholders analysis is helpful to the User Forum because it provides valuable information regarding actors, interests and relationships. This will provide a basic list with participants for the User Forum.

2.2 Methodology

There are many ways of performing a stakeholder analysis. All methods start with an inventory and identification of stakeholders, followed by a classification of the most important and influential stakeholders. In this study we have chosen to follow the methodology designed by the Victorian Department of Primary Industries as described by Nicole Kennon et al. in 2009. Their Stakeholder Analysis Tool is focussed on start-up processes and stakeholders in project planning and implementation. As the core of the analysis, identified stakeholders are prioritised along two axes, which are labelled ‘influencing’ and ‘enabling’, with the difference being (Kennon et al., 2009):

- *Influencing* refers to stakeholders who have power (direct or indirect) over the success of the project, including financial, positional authority or persuasive power over key decision-makers. In our case, we look at the influence of a stakeholder on the adoption of GNSS;
- *enabling* refers to those who contribute to the delivery of project outcomes. These people may include opinion leaders (perhaps in the target population for the project), critical knowledge resources (e.g. scientific experts), and providers of enabling resources (e.g. mapping technology) or those critical in delivery of innovations produced by the project. In our case we look in particular at stakeholders that deliver equipment, knowledge or incentives to adopt GNSS.

Normally a stakeholder matrix is used with important and influential on the axes, but in our approach we use influence vs enabling (Nicole Kennon et al, 2009; see Figure 4). According to Kennon et al., these terms do improve (significantly) the understanding of the two dimensions of the matrix and the differences between them.

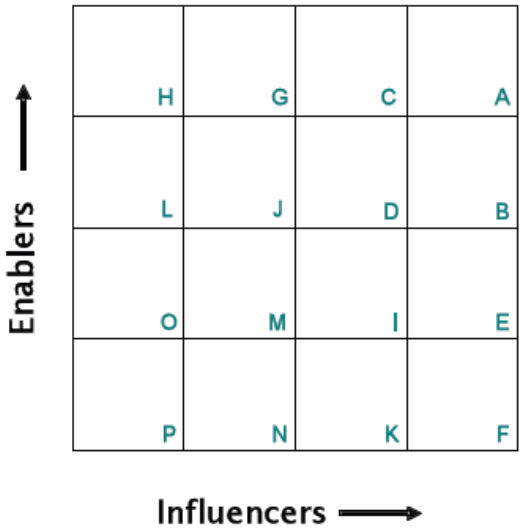

Figure 1: Stakeholder matrix with enablers and influencers. The cells ABCD – and to a lesser extend G and E – contain relevant stakeholders.

2.3 Identification of stakeholders to GNSS use in agriculture

Before ranking stakeholders we first need to identify stakeholders. We are looking for relevant organisations in the use of GNSS in agriculture. We have done this, by describing the generic processes of agricultural production.. It shows the farm, as the main actor in the primary production process. The farmer utilises his resources according to his preferences. The constraints and possibilities offered to the farm are framing what is possible. Following this description we identified stakeholders for different processes.

Furthermore, we have been using the different motives for GNSS use, as has been described in State-of-the-Art analysis (SotA) of UNIFARM. Based on the materials from the UNIFARM SotA identified three different GNSS application interests areas in agriculture indicating distinctive purposes of use:

- Production efficiency – (GNSS systems are purchased to reduce costs, increase yields and improve efficiency);
- Wholefarm Information management – (GNSS systems provide location in telemetry and other tracking systems and contribute to wholefarm information management);
- License to Operate – (GNSS systems aid in proving compliance, reducing (preventing) unintended activities and provide accountability throughout the production chain).

The different interests areas have different ‘business cases’ for GNSS use.

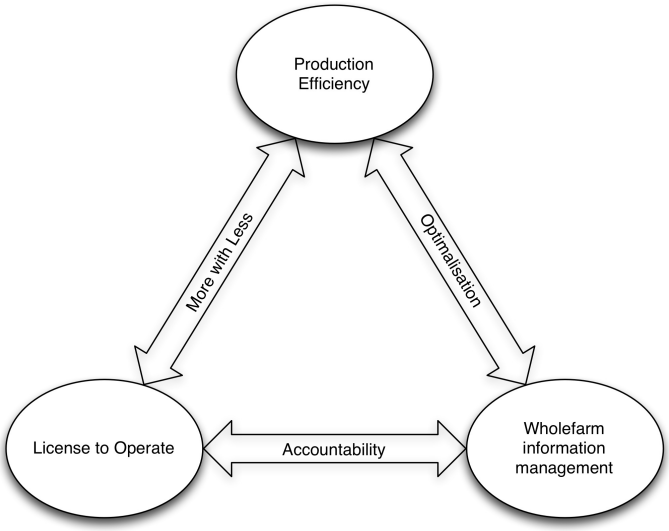

Figure 2: Motives for investments in GNSS. (from UNIFARM SotA)

2.4 Classification of identified stakeholders

After identifying them, stakeholders are assessed on their influence and or enabling role on the adoption of GNSS use. The classification is determined by the authors' judgement and feedback of the project partners.

To find the most relevant stakeholders and stakeholder bodies each stakeholder found should be analysed based on his enabling and influence level. Figure 1 is a typical example of such a matrix. Those who are ranked high on both axes will have more impact on the adoption of GNSS use in agriculture then those who are low on both axes. The figure shows that box ABCD represents the quarter with most relevant and representative stakeholder bodies to focus on for the User Forum. Stakeholder bodies in the segment E and G can also act as relevant stakeholder members (Kennon et al., 2009).

3 STAKEHOLDER ANALYSIS

3.1 Introduction

The use of GNSS in agriculture is quite differentiated across Europe and accross sectors. In order to get a good understanding the stakeholder domain of the farmer is sketched (see Figure 4). In this sketch the environment of the farm is generalised to create a quick understanding that is covering all farms. The Farm is depicted as the central entity. The farmer runs the farm and has a set of resources to his availability (labour, capital, etc.). The farmer also has his preferences, comprising the farmers' vision on what he wants to achieve with his undertaking and how. The supply side (the upstream industry) consists of (but is not restricted to) machine manufacturers, GNSS industry, seeds companies, fertiliser companies etc.

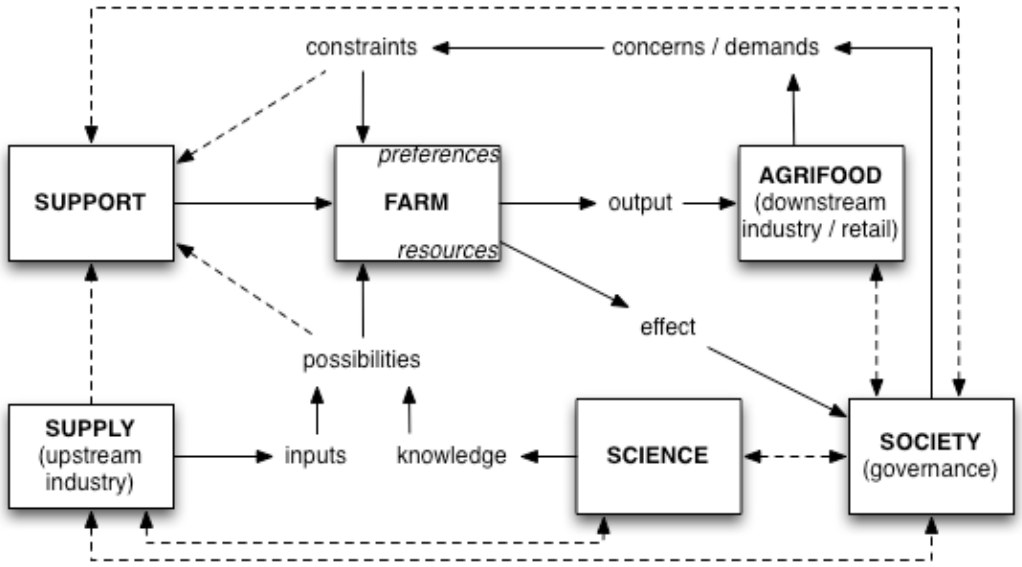

Figure 3: the operational environment of the agricultural sector.

With his farm the farmer produces output that is in general sold to the agrifood industry including retail. His production has side effects that affect the way society looks at the farm. In case of disagreement, society pushes to constrain (or persuade) the farmer to more agreeable practices. The same holds for the agrifood industry that has demands for specific quality.

The Science segment interferes in this domain in many ways, providing new knowledge to farmers (and others as well clearly) as well as interacting with society to provide input for policy design.

And finally, there is the Support segment, a substantial influencer of the farmer that is trying to combine all available knowledge and information to provide the farmer with adequate advice. These "supporters" provide advice to farmers and help him making decisions,

This generic view on the farmers' environment is used to identify different roles towards the aspect of GNSS use in agriculture. We have 'GNSS use in Agriculture' divided in:

- Farmers;
- Support (providing advice to the farmer, including occasional on-farm data collection);
- Supply or Upstream Industry (suppliers of relevant inputs to operate the farm);
- Demand or Downstream Industry / Agrifood (buyers of farmers produce);
- Science (providers of knowledge and inspiration that promotes GNSS use);

- Governance (society in its many different occurrences that provide guidance and constraints).

In order to identify stakeholders, an inventory of these roles has been carried out for the three different motives to invest in GNSS, as has been described in the SotA: Improvement of Production Efficiency, License to Operate and Wholefarm Information Management

3.1.1 Improvement of Production Efficiency

As in other commercial sectors the improvement of the production efficiency is also in agriculture a main driver. This can be expressed in terms of productivity, like production per ha, or production per m^3 water, or production per unit of labour. It depends on the agricultural activity and the region which expression applies or dominates. GNSS applications play an important role in innovating farms aiming at improvement of production efficiency. Machine guidance (including parallel driving, Controlled Traffic Farming and route optimisation for example) is beneficial in its prevention of overlaps and misses during fieldwork. Furthermore, variable rate application of fertiliser, seed and crop protection agents is an upcoming technology. Harvest monitoring can be used for better farm management but also to record input and output relationships and optimize production. Biomass monitoring and precision soil sampling are mainly used in combination with variable rate application. The basis is to fine-tune inputs with known or well-assessed precondition to optimise yields. In general these applications involve reductions in the use of farm-inputs like fertiliser and other chemicals, which is beneficiary for the environment.

3.1.2 License to Operate

The agrifood domain as a whole embraces the sustainability concept with a great sense of urgency. Governments, food producers and supply industries like Agricultural Engineering Industry and Agro Chemistry find that managing the social and environmental footprint of agriculture will maintain and improve the “License to Operate”: the implicit consent of government and society to allow companies to carry out their commercial activities with minimised regulatory interference or opposition from local communities. We include in this class the activities to proof or control subsidy applications and compliance to relevant regulations such as the water framework directive and the habitat directive.

Registration of farm activity and animal welfare can be supported by GNSS (location and timing). Also the so-called On-The-Spot (OTS) checks of parcel area and identification of areas out of the good agricultural and environmental conditions (GAEC), is nowadays done by GNSS.

3.1.3 Wholefarm Information Management

This class implies the ability to develop a whole farm information management system where field data is integrated with planning and administration, partially urged by the development of larger farms. The GNSS applications in this class comprise machine telemetric systems, cattle tracking etcetera. Main applications also imply dairy farming solutions like virtual fencing and individual livestock tracking. On farm in-field and inter-field logistics are key issues as well.

3.1.4 Logistics

Picking up and transport of farm produce is a logistic process that can easily be supported by GNSS. Examples are in milk collection and picking-up sugar beets or potatoes from GNSS indicated locations. In the EU Council Regulation (EC) 1 of 2005 on the protection of animals during transport and related operations, livestock transport longer than 8 hours requires a GNSS logger with temperature sensor. The tracks are stored in the so-called Traces system.

	Position	Position, Time	Position, Time and Navigation
Production Efficiency	Mapping; Variable Rate Application; Field work optimisation; sampling;	Harvest monitoring; animal tracking;	Machine Guidance; Robotics; UASs; Harvest pick-up; Transport.
wholefarm information management	Unique parcel ID; Mapping; Crop Rotation; Daily Planning; contracting.	Farm machine movement; Registration of field work; animal tracking; virtual fencing;	
License to Operate	Mapping; CAP declaration; Area Measurement; Control; Eco Focus	Livestock Welfare in Transport; Spraying logbook; Track&Trace (produce, livestock, manure, etc.)	"Virtual fence" (both machines and animals)

Figure 1: Classification of GNSS applications per segment

Analysing the SotA a lot of organisations can be identified as stakeholders for GNSS use in the agriculture sector. Some of them are quite straightforward like the farmer, GSA and machine manufacturers. GNSS use in Agriculture has many different occurrences. The applications of GNSS in agriculture can be divided in the aspect of the GNSS signal used (positioning, timing or navigation information). In Figure 1 we have created a list of typical applications for the 3 different motives and classified along the GNSS aspects.

Applications can belong to more than one segment, or this may vary in time. Variable rate application and soil sampling is now used mainly for production efficiency but in future they may become obligatory for organic farming f.i. machine guidance is classified under production efficiency but in some cases can be qualified as farm management or logistics tool.

In the next paragraphs the segments are further explained.

3.2 Inventory of stakeholders

As mentioned before there is a wide array of stakeholders for GNSS use in agriculture. To obtain a first overview of relevant stakeholders we first look at the stakeholder bodies per segment.

3.2.1 Farm

Farmer

The farmer is one of the core users of GNSS in agriculture and therefore an important stakeholder. The increase of GNNS applications in agriculture depends much on the acceptance and adoption by the farmer.

Local group

Local study and innovation groups are (often informal) organisations of farmers that exchange knowledge, pick up innovations and act as a group towards other stakeholders. The are regionally organised around a specific topic. In the Netherlands for example two farmer groups (H-Wodka and Wiski) are promoting and improving the use of GNSS and GIS in agriculture. But also farmer groups related to potatoes, flowers etc. belong to this stakeholder group.

Farmer organisation or Union

These are (mainly regional or national) lobby and interest organisations for farmers or complying sectors like contractors etc. They operate as a 'one voice' representative of their sector. On the European level they have umbrella organisations to meet the EU level and discuss with the EC, like for example COPA COGECA (representative Farmers Unions and Cooperatives) and CEETTAR (the European representatives of farm contractors). CEJA (European Council of Young Farmers) is important in this group because adoptive power and interest of young farmer is traditionally larger as compared to older farmers.

Contractor

The contractor works for the farmer and takes care of specialised tasks. As Contractors often have specialised machinery and are making more intensive use of farm machinery, their investments in GNSS are often returned at a higher rate than the farmer himself. Most contractors work on a local level but are represented by CEETTAR on European level.

3.2.2 Supply Industry and Services

Inputs industry and service

This industry provides agricultural inputs into the agricultural and farming sector. The sector consist of various groups, including animal feed, crops protection, fertilisers and seed. Examples are YARA and OCI. Also seed and crop protection companies like Syngenta and Monsanto are relevant inputs providers. At the local level, trade companies that sell their inputs also provide advisory services, that can include precision farming advice.

Machine Manufacturing Industry

This group consists of all companies who produce agricultural machinery, equipped with GNSS receivers and related products. Large multinationals are JohnDeere, Claas, CNH and Acgo, who produce tractors and GNSS based implements on a large scale and also invest in GNSS research and applications. Also more regional manufacturers, who are producing GNSS derived products, like SBG, Mueller Elektronik and Homburg, play an important role in GNSS uptake. Machine manufacturers are associated in the the CEMA at the European level. Representatives also form the AET (Agricultural Engineering & Technology) working group, part of the European Technology Platform Manufuture.

FMS developer

Farm Management Systems (FMS) are becoming more and more important in agriculture for planning and documenting farm activities. The increase in information demand from buyers, advisors and goverments and at the other side the increase in information availability (remote sensing, sampling, telemetry, market information) make it almost impossible for farmers to do with an appropriate FMS. Traditionally FMSs focused on financial issues only but recently whole farm management is in focus. Companies working on this are AgroVision and Crop-R (Netherlands), Farmworks (international by Trimble), AgrarOffice (Progis, AT), Isagri (Fr.). Also, farm machinery manufacturers more and more move into office software. It is also important to mention ESRI in this respect, coming from the GIS side, and improving their FMS like presence.

GNSS Industry

This stakeholder group we include all stakeholders involved with GNSS technologies as a basic system. Applications used for guidance or for tracking belong to this category.

Representatives of this sector are producers of GNSS equipment like Topcon, Hexagon, Trimble and JohnDeere.

Standardisation body (1)

Standardisation is a key issue because a lot of different players (manufacturers, services) act in the value chain from GNSS signal to application. An important achievement is the international ISOBUS standard. It is a standard, which enhances and coordinates control and communications on tractors and implements, not only by using uniform data protocols but also uniform plugs and connectors. The Agricultural industries Electronics Foundation (AEF) is working on the succession of ISOBUS and also on other applications.

3.2.3 Support and Advisory Services

Advisor

This group consists of all advisory organisations related to agriculture and GNSS. Often and traditionally they were steered and financed by governments. From the late 80s more and more private companies and supply industry took over or complemented this. VFL in Denmark and DLV in the Netherlands are examples of these groups.

Financial sector

The financial sector is important for this segment, consisting of banks and cooperatives providing capital, as well as insurance companies. GNSS equipment demands a higher investment. Although high cost of GNSS equipment was mentioned as a barrier for adoption we believe money is not a main obstacle. However, the use of GNSS may provide better yields and higher profits, hence a relevant base for loans and insurances. Concerning land related insurances, agents are using GNSS equipment to measure and locate the land that is subject to a insurance.

Sensing Companies

Sensing is an up-and-coming method in providing farmers with (near) real time information for precision agriculture applications such as water stress monitoring, detection of nutrient deficiencies and crop diseases to help decision making on a farm level. Sensing comes in two flavours: the direct sensing and the remote sensing. Direct sensing involves tractor-mounted equipment, such as the YARA N-Sensor, Trimble Greenseeker or the Fritzmeier sensor. Remote sensing is done with satellites or increasingly with unmanned aerial systems (UAS). Companies active in this field are Astrium (Farmstar), Geosys, eLeaf, Terrasphere and Sarmap. In the UAS there are a number of upcoming companies, but their level of service is still rudimentary. UAS are expected to become more relevant after 2015.

GNSS Correction signal provider

For precision farming most applications demand precision of at least 1-2 meters and sometimes even 2 cm. Different companies offer these correction signals needed to reach this kind of precision. In particular dedicated companies exploit a network of reference stations and provide subscriptions to the correction signal. Starfire by JohnDeere and Omnistar by Trimble are relevant representatives. At a more local level different DGPS or RTK signal providers are active. In the Netherlands, 06-GPS operates the MoveRTK service that offers a relatively cheap but high quality service to farmers with RTK equipment.

3.2.4 Agrifood Industry

Agrifood Industry

The Food industry, represented by big organisations like Ahold, Lidl, Nestle, Danone etc, are becoming important in the GNSS use in agriculture. Consumers are more and more interested in the origin of the (fresh) products they buy. With the use of track and trace it is relatively easy to respond to this request. But also the outbreak of diseases as a result of infected agricultural products, like the EHEC bacteria in 2011, makes track and tracing important for the food industry, and of course also for the health segment. The influence of Agrifood on GNSS adoption is expected to increase but is not high at present.

Transport company

For transport of life animals and collecting harvested sugar beets GNSS application is or becomes essential to comply with internationals rules or optimizing transport routes. Additionally also other applications will arise and increase in the logistics sector on behalf of GNSS use in agriculture. Although transport is of course found at all levels and subsectors, we chose to put it here in the agrifood section, as the use of GNSS for tracking and tracing of agricultural produce is expected to be most profound. Clearly, this can also be seen as a non-agricultural activity.

Standardisation Body (2)

Standardisation in the Agrifood and agriculture interchange is best represented by GLOBALGAP, a not-for-profit organization with a crucial objective: safe, sustainable agricultural production worldwide. It set voluntary standards for the certification of agricultural products around the globe so producers, suppliers and buyers are harmonizing their certification standards to match. Other standards arise as well, some on product quality, some on location of origin etc. It is expected that GNSS will add to automated documentation required by such standards, as well as 'proof' of compliance (see: licence to operate, above) both for sector and government.

Other standardisation initiatives are DAPLOS, AgroXML and EDITEELT (Netherlands) that include parcels and other geographic information in their data descriptions.

3.2.5 Societal organisations and Government

European Commission (EC)

The EC is a large institution concerning GNSS use it consists of different stakeholders. Some aspects of the EC:

The European GNSS Agency (GSA) governs the European navigation programmes. It stimulates research and innovation efforts with funding under the EU's Seventh Framework Programme (FP7). GSA acknowledges that GNSS use in agriculture is an important factor and huge and important growth of applications is expected.

DG Agriculture and Rural Development (DG-AGRI) is responsible for the Common Agriculture Policy (CAP). The CAP fulfils an important role in the development of agriculture. In 2013 decisions will be made on a new reform of the CAP for the period 2014-2020. Farm subsidies are to be decreased, adjustment to world markets is enhanced and interaction with the environment becomes more important. This requires planning and documenting where, when and what activities take place.

DG Environment (DG-ENV) is responsible for several directives that affect farm activities, such as the Habitat Directive and the Water Framework Directive.

DG Health and Consumers (DG-SANCO) is responsible for the animal welfare strategy. In particularly Regulation (1)/2005 is relevant that regulates the use of GNSS during long term animal transport. The rules for on-farm animal welfare are also relevant. Furthermore DG-SANCO is responsible for the General Food Law implementing the food safety strategy and the so-called farm-to-fork approach in food legislation. Also, DG-SANCO is responsible for veterinary aspects and hosts the EU Veterinary Emergency Team.

DG Enterprise and Industry (DG-ENTR) is responsible for the Galileo programme.

Payment Agency

Conform CAP regulation all EC countries have Payment Agencies who are responsible of control, providence and distribution of Farm subsidies. As area measurement is vital for this process GNSS applications are crucial, especially as new CAP aims for 1: 5000 map scale. Payment Agencies (or their control bodies) use GNSS to verify claimed areas for subsidies, the so-called On The Spot (OTS) control. In near future, their declaration systems become ready to receive GNSS tracks made by farmers to support their area claims. This will presumably has an effect on GNSS use.

Standardisation Body (3)

UN-CEFACT

The United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) was established, as a subsidiary, intergovernmental body of the UNECE (United Nations Economic Commission for Europe) Committee on Trade, mandated to develop a programme of work of global relevance to achieve improved worldwide coordination and cooperation in these areas. UN/CEFACT supports activities dedicated to improving the ability of business, trade and administrative organizations, from developed, developing and transition economies, to exchange products and relevant services effectively. Its principal focus is on facilitating national and international transactions, through the simplification and harmonization of processes, procedures and information flows, and so contributing to the growth of global commerce.

UN-FAO

This United Nations agency aims internationally on defeating hunger by helping developing countries modernize and improve agriculture. For Europe the organization works as a neutral forum for sustainable agriculture.

NGOs

International livestock transport is an important issue for welfare organisations. Since 2005 EU guidelines impose that international transport of livestock may not exceed 8 hours. Worldwide the influence of welfare organisations in improving animal welfare is increasing. This could lead to other EU guidelines as well.

Other NGOs are active in (against) GMO, Food Quality, Rural Development etc. Their impact on the policy making is generally quite high, considering their budgets. They represent a serious comment on our society. Their success depends on the subject. Via precision farming, NGOs related to environment, biodiversity and climate change may have an relevant role in promoting GNSS in agriculture.

3.2.6 Science organisations

Research organisations

As the world becomes more populated every year and arable land becomes scarce, research on agriculture and food supply is regaining relevance. Doing more with less (more production with less inputs) is the holy grail. Precision farming and GNSS applications are enablers for this increased efficiency, including the production per capita. Also the environment can benefit from GNSS because of less chemical use on specific site application. Research organisations are alo multi-leveled. At local level, very applied sciences translate global knowledge in dedicated applications for specific issues at the local level. At the other end, internationally renowned institutions provide high innovative technology and knowledge that can be applied universally. Examples of these are the universities of Wageningen, Aarhus, Dresden, Brno, Leuven, Reggio Emilia and Modena and many others.

Research Programmes (funding organisations)

All kinds of research programmes lead to collaborations and associations of companies and science institutions in consortia that undertake a dedicated task or issue. In this category not only national research programs (f.i. PPL programme precision farming Netherlands and I-green in Germany) exists also networks in Europe play an important role, in particular broad together under FP7 (and H2020 in future), ERANET (ICT-Agri), INTERREG, Regional Development Fund and other programmes.

3.2.7 Ordering stakeholders

In a first ordering of stakeholders we have mapped then on a two dimensional matrix, with the geographic scale on one axis and the role in the agricultural chain on the other axis. These roles are derived from the description of the operational environment of the farmer (Figure 3), prime user (farm), support, supply (incl. manufacturing), agrifood industry, Research and Governance. In order to identify the different geographic scale of operations of these stakeholders, we have put them on a geographic scale, from local to global. The different scales are: Farm, Regional, National, Europe and World. Figure 4 gives a graphical representation of this exercise. Where necessary, some stakeholder bodies have been split into specific sub-stakeholders when the geographic scale is different for these sub-stakeholders.

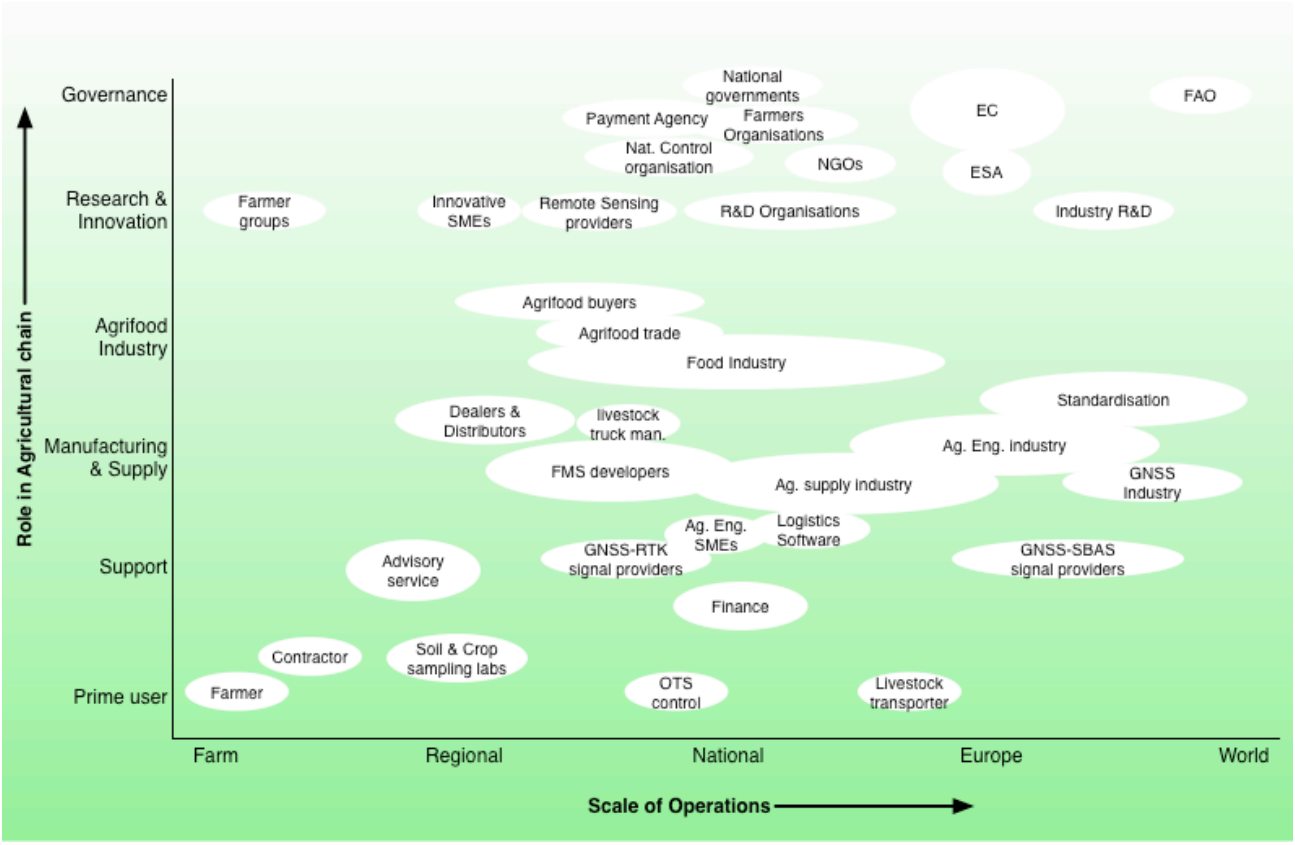

Figure 4: Stakeholders of GNSS use in Agriculture, ordered according to role and scale of operations.

3.3 Ranking of stakeholder bodies

After identifying the most important stakeholder bodies for this project per segment, we now rank the stakeholder bodies relevant for GNSS use in agriculture by ranking the stakeholders in an enabling/influencers diagram as explained in paragraph 2.3 to find the most relevant actors for the User Forum. The results of the ranking of the enabling and influence level of the stakeholder bodies are outlined in Figure 5. Those who are ranked high on both axes are key players in the GNSS adoption and have a high priority for the engagement for the User Forum; those who are low on both axes have a low priority. Stakeholders plotted in the ABCD rectangle represent the quarter with most relevant and representative stakeholder bodies to focus on for the User Forum. These are: Farmers, Contractors, Farmers Unions, Advisors, Research Programmes and Research Organisations, Machine Manufacturers, Standardisation Bodies (from the AgEng area), and the European Commission. For EC in general, regulation and concrete policies are important; At present mainly in farm subsidies, animal transport and food security. We expect this enabling to increase in future. Stakeholder bodies in the segment E and G can also act as relevant stakeholder members, being the Payment Agencies and the GNSS industry.

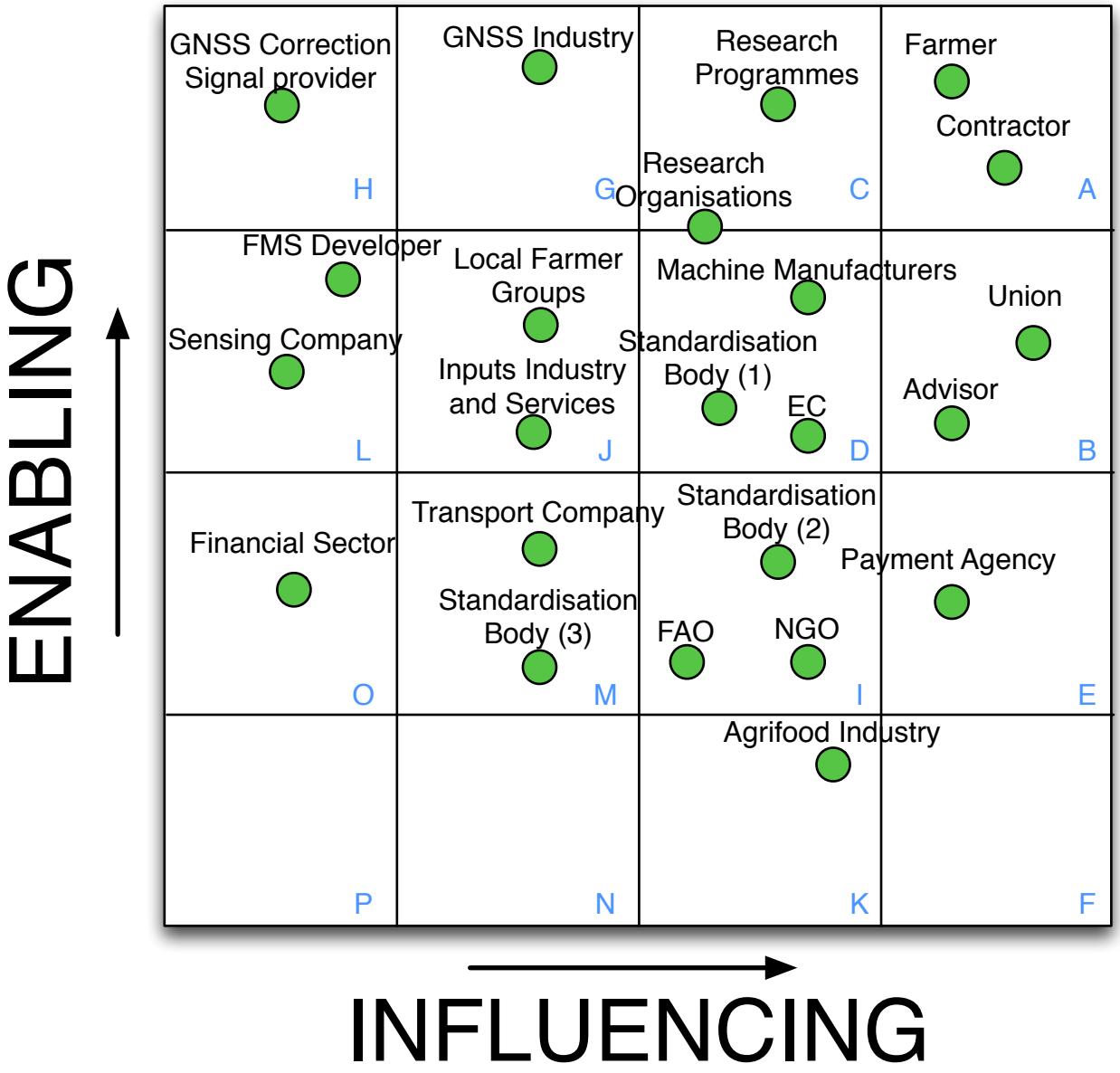

Figure 5: Ranking of stakeholder bodies

In 'A' the most important stakeholders for GNSS uptake in agriculture are the farmer himself and the contractor. The latter, being more machine centred, has a stronger business case to adopt GNSS technology and can be considered from the mechanisation and engineering point of view as first adopters.

To broaden the list of potential User Forum members we can decide to use the stakeholders identified in the right upper half of the diagram. In this case also the GNSS industry and Payment agencies can be included as relevant stakeholder bodies for GNSS use in agriculture.

Applying general theory of power/interest analysis the upper left corner shows stakeholders that need to stay informed in this area. Here the supporters are found. In our case all companies

developing GNSS-related products, signal providers, remote sensing companies, FMS developers, but also innovative farmer groups and farm supply industry are identified.

Right below are the more critical organisations, NGOs (welfare), FAO and agrifood industries. They must be kept satisfied about progress but have no direct benefit from the developments.

Payment agencies and agrifood industries are ranked as critical organisations, but with growing importance of registrations (parcel, tracking) these stakeholders can increase in enabling capacity and therefore become key players. This can mean a turning point in the adoption of GNSS in agriculture.

On the left lower side not many parties are found. Finance we believe is essential but not an obstructive enabler. Logistics is categorized as low enabled/low influencer. Although legislation for animal welfare during transport has been boosting GNSS use we do not believe further stimulation of logistics will enhance GNSS use in agriculture to a great extent.

For the acceptance of GNSS it can also be important to find an organisation or action, which can act as leverage. Then stakeholders can be forced to the upper right hand side of the diagram.

Education is absent as a stakeholder group. It could be placed in the matrix but its influence is too low. We expect that if precision agriculture becomes more established it will be more often included in agricultural school and University curricula. Vice versa, inclusion of PA in curricula will have a stimulating effect on the uptake of GNSS.

Farmers and Contractors are of course the most relevant stakeholders for the adoption of GNSS in agriculture, as it is a technology that improves the working of their machines and resources. The work on a European level with farmers and contractors may run into difficulties, first of all, farmers often don’t speak English fluently and secondly, they are not easy traveling away from their farms for a longer time. For the User Forum, farmers representatives, like farmer unions and contractor organisations seem to be more logical partners. At this stage we look at COPA/COGECA and CEETTAR as relevant members of the User Forum for GNSS use in Agriculture.

4 CONCLUSIONS

Based on the stakeholder analysis we conclude the following:

- GNSS use in agriculture has many different stakeholders acting at different levels from farm to world level;
- The following stakeholder bodies are important for the User Forum: Farmers, Contractors, Agriculture engineering industry, Farmer organisations or Unions, Advisors and the EC. GNSS industry and Payment agencies are ranked at the second place;
- There is not one stakeholder who can act as a “leader” in the adoption of GNSS use in agriculture;
- There are 2 stakeholder bodies (payment agencies (or CAP regulations) and agrifood industry) who have the potential to become key players and push the GNSS application;
- Within the EC-group, DG-AGRI and DG-ENV are the most relevant stakeholders within the EC organisation towards on-farm use of GNSS. DG-SANCO is the most relevant EC stakeholder for the transport.

It can be concluded that this Stakeholder Analysis provides a solid benefit to continue assembling the User Forum. As the topic of GNSS adoption has a regulatory side (via the CAP regulations) as well as a precision agriculture side, both aspects have been presented here in an integrated way. This is a new way of presenting stakeholders which is very useful to understand the whole field and the connection between policy and practice.