

Application of Satellite Navigator and Light Bar System in Farm Tractor

Mohit Kumar^{1*}, Rajesh U Modi², Rajeshwar Sanodiya³, Rahul Kumar¹ and Vikas Pagare³

¹Sri Karan Narendra Agriculture University, Jobner, Jaipur- 303329, Rajasthan, India

²ICAR- Indian Institute of Sugarcane Research, Lucknow- 226002, Uttar Pradesh, India

³ICAR- Central Institute of Agriculture Engineering, Bhopal- 462038, Madhay Pradesh, India

*Correspondence: mohit.agengg@sknau.ac.in

Introduction

Precision Farming and the use of Global Positioning Systems on agricultural machinery, provide location and time information of all treatments. GPS has application in soil mapping, yield mapping. Precision farming is the spatial analysis capabilities of GIS that enable precision agriculture. GPS has greatly enabled precision farming and of great importance to precision farming, particularly for tractor guidance and digital evaluation modelling position accuracies at the centimetre level are possible in GPS receivers. The government claims that India has emerged as the seventh largest exporter of food grains in the world. For agriculture application GPS equipment manufacturers are now quoting repeatable result of ± 1 to 5 centimetre at 95% confidence level. In the next 5 years Indian Government estimated about 30- 40% increased use of GPS based precision farming in total agriculture industry. To increase productivity on a global scale, precision farming is a must for India. In India, operator drives the tractor or combine harvester simply by their judgment. Due to which there may have missing or overlapped areas in the fields, resulting lesser productivity. India have agriculture as a backbone with around 5.23 million of tractors in the country. As seen from mechanisation window the precision farming with satellite-based operations would be pursued. The navigation system with the light bar will enhance the productivity and reduce the operating time which may be devoted to words other productive work. A time for a particular crop in a particular window period is less, so there is a need of a satellite based light bar installed in a farm tractor which will hire a faster operation. Precision farming features as one of the main research agenda in almost every five-year plan, which involves utilizing state-of art GNSS services with GIS.

Global positioning system (GPS) navigation technologies (NT) such as lightbars (LB) and Auto-Guidance systems (AGS) are commercially available, promising technologies to increase efficiency of field operations. GPS navigation allows more timely field operations improving yields and increasing area farmed with a given equipment set. GPS NT have been used for spatially sensitive practices such as controlled trafficking in compaction prone soils, side-dress nitrogen, and input placement in strip till systems. In conventional farming, skilled drivers are needed to operate tractor or combines effi-

ciently. The requirement placed on farm equipment operators have changed drastically with increase in equipment size, power, multiple equipment functions, and speeds well as monitors reporting on specific system performance. These increasing demands on the operator can result in increased errors in function, costs, environmental problems, and operator fatigue. Missed area after completion of work or repeat operation over the work already done that is, overlap decides work quality. Which is difficult to predict visually. To maintain the work quality, one has to repeat the operation over the whole field. These causes an additional expenditure for the same quality of work over unit area. If these overlapping operations are carried over the missing operations rather than repeating the whole operation, so many inputs of the agriculture like fuel, labour, time etc. would be saved. Which mainly includes time-for which we are paying more than any other agricultural input. Also in farming work using agricultural vehicles such as tractors, it is important to minimize the area of unworked and double-worked land by driving the vehicle straight and at a constant interval in the field in order to achieve high efficiency and the optimum use of inputs such as fertilizers and chemicals.

Commercial sensors receiving and processing GPS signals have become affordable for most farmers in developed countries. Handheld GPS receivers provide positioning accuracy within ± 100 m. Differential GPS (DGPS) reduces the error to ± 2 m. A relative positioning GPS brings the error down to the sub-centimetre level. This accuracy can be maintained for moving vehicles using a real-time kinematic (RTK) GPS.

Different Types of Satellite Navigator and Light Bar System

There are two basic categories of satellite navigation system which are subdivided as follows:

1. Lightbar guidance: The operator responds to visual cues to steer the equipment based on positional information provided by a GPS. Also known as GPS + Navigation Aids.
 - a. A baseline scenario with foam, disk, or another visual marker reference.
 - b. Lightbar (LB) navigation with basic GPS availability (± 0.3 m accuracy).
 - c. Lightbar (LB) with satellite subscription correction GPS (± 0.1 m).
 - d. Automated guidance (AGS) with satellite subscription (± 0.1 m).
 - e. Automated guidance (AGS) with a base station RTK GPS (± 0.01 m).