
Contents

| | |
|---|----|
| Introduction | xi |
| Part 1. The Development of Digital Technology in Agriculture: An Innovation Process. | 1 |
| Chapter 1. Towards Digital Agriculture? | 3 |
| 1.1. Agricultural evolution: modernization and ecologization. | 4 |
| 1.1.1. Agricultural modernization | 4 |
| 1.1.2. Integrating environmental concerns | 7 |
| 1.2. Digital technology in agriculture | 10 |
| 1.2.1. Characteristics of digital technology | 10 |
| 1.2.2. Digital technology as an object of research in social sciences | 14 |
| 1.2.3. Digital technology in agriculture | 18 |
| 1.3. Transformation of the agricultural sector | 24 |
| 1.3.1. Changes at the actor level in the agricultural sector. | 24 |
| 1.3.2. Public policies and digital development | 29 |
| 1.3.3. Digital technology uses in farms | 33 |
| 1.4. Controversies surrounding digital technology and ecology in agriculture. | 36 |
| 1.4.1. Digital technology and ecology | 37 |
| 1.4.2. Controversies in the agricultural sector | 39 |
| 1.4.3. Controversies surrounding digital technology and pathways to ecologization. | 44 |
| 1.5. Conclusion | 46 |

| | |
|---|-----|
| Chapter 2. Political Economy of Innovation and the Study of Agricultural Transformations | 49 |
| 2.1. A systemic approach to digital technology in the agricultural sector | 50 |
| 2.1.1. Digital development in agriculture: an innovation process | 50 |
| 2.1.2. Transformation of the AIS | 59 |
| 2.1.3. Choice of a structural analysis of innovation systems | 63 |
| 2.2. Integrating sectoral heterogeneity to study ecological agriculture | 66 |
| 2.2.1. Integration of ecological issues in agriculture | 66 |
| 2.2.2. Political economy of AISs | 70 |
| 2.2.3. Integrating heterogeneity within the agricultural sector | 72 |
| 2.3. Integrating multiple scales to study AISs | 78 |
| 2.3.1. Integration of the microeconomic scale | 78 |
| 2.3.2. Interaction between analysis scales | 83 |
| 2.4. Conclusion | 87 |
| | |
| Chapter 3. Digital Technology and Ecological Agriculture: Multi-scale Transformations | 91 |
| 3.1. Perceptions and commitments of actors in the innovation system | 94 |
| 3.1.1. Components of the agricultural innovation system | 94 |
| 3.1.2. Focusing on the French agricultural sector | 99 |
| 3.1.3. Abductive coding analysis | 99 |
| 3.2. Uses of digital technology and the transformations of practices in agricultural operations | 100 |
| 3.2.1. Investigating practices and uses | 100 |
| 3.2.2. Focus on the field crop sector in Occitanie | 102 |
| 3.2.3. Mixed method of analysis | 103 |
| 3.3. Intermediate organizations: between diffusion and transformation of innovations | 104 |
| 3.3.1. Intermediaries and cooperatives in innovation systems | 104 |
| 3.3.2. Dual representation of agricultural cooperatives | 107 |
| 3.3.3. Focusing on the wine industry in Occitanie | 108 |
| 3.3.4. Cooperative strategies | 110 |
| 3.4. Conclusion | 110 |

| | |
|---|-----|
| Part 2. The Development of Digital Technology in Agriculture at Different Scales | 111 |
| | |
| Chapter 4. The Development of Digital Technology in the Agricultural Innovation System | 113 |
| 4.1. Perceptions of actors in the agricultural innovation system. | 114 |
| 4.1.1. Diversity of expectations according to organic and conventional paradigms | 115 |
| 4.1.2. Knowledge and technologies at the heart of the digitalization process | 119 |
| 4.1.3. Different partnership strategies with digital actors | 120 |
| 4.1.4. Low awareness of the internal heterogeneity of the agricultural innovation system by digital actors. | 122 |
| 4.1.5. Major difference between paradigms: the risks perceived by actors | 123 |
| 4.2. Digitalization beyond paradigms | 125 |
| 4.3. Diversity of digitalization trajectories envisioned | 127 |
| 4.4. Analysis of innovation systems reinforced by taking into account heterogeneities and power relations | 128 |
| 4.5. Contributions and perspectives | 130 |
| | |
| Chapter 5. The Development of Digital Technology in Agricultural Operations | 133 |
| 5.1. Diversity of technologies and uses of digital technology | 135 |
| 5.1.1. Sample description | 135 |
| 5.1.2. Adoption of digital technologies in our sample | 136 |
| 5.1.3. Use of farm parcel management software | 138 |
| 5.1.4. Use of guidance | 140 |
| 5.1.5. Modulation use | 142 |
| 5.1.6. Internet usage | 144 |
| 5.2. Profiles of use | 144 |
| 5.2.1. Digital technologies for production associated with productive models | 146 |
| 5.2.2. Digital technologies for information and communication associated with individual practices | 149 |
| 5.3. Digital uses and ecologization. | 151 |
| 5.3.1. DTP, industrialization and weak or symbolic ecologization. | 151 |
| 5.3.2. DTC, knowledge and ecologization | 155 |
| 5.3.3. Trajectories | 156 |

| | |
|---|------------|
| 5.4. Digitalization: an imposed, desired or contested trajectory? | 157 |
| 5.4.1. The influence of regulation, institutions and public policies. | 157 |
| 5.4.2. Farmers committed to and driving the development of digital technology | 159 |
| 5.4.3. Opposition to digital technology | 160 |
| 5.5. Contributions and perspectives | 162 |
| | |
| Chapter 6. The Role of Cooperatives in the Development of Digital Technology | 165 |
| 6.1. Cooperatives engaged in various forms of ecologization | 166 |
| 6.2. Cooperatives involved in digitalization projects | 168 |
| 6.3. New functions of cooperatives with digital technology | 171 |
| 6.3.1. Economic intermediation | 171 |
| 6.3.2. Technical intermediation | 173 |
| 6.3.3. Knowledge intermediation | 173 |
| 6.3.4. Regulatory intermediation. | 175 |
| 6.3.5. The evolution of their role as a collective organization. | 175 |
| 6.4. The role of bridging digital and environmental challenges | 175 |
| 6.4.1. Articulation of these issues through the functions of intermediaries | 175 |
| 6.4.2. Differences according to the type of cooperative | 177 |
| 6.5. Contributions and perspectives | 177 |
| | |
| Chapter 7. Discussion: Digital Technologies for What Kind of Ecological Agriculture? | 179 |
| 7.1. Digital trajectories linked to agricultural models. | 180 |
| 7.1.1. The diversity of digital trajectories | 180 |
| 7.1.2. Aspirations associated with agricultural models. | 182 |
| 7.1.3. Uses embedded in production models. | 183 |
| 7.2. The continuation of historical transformations of the agricultural sector. | 184 |
| 7.2.1. Digital technology as an accelerator of ongoing transformations. | 185 |
| 7.2.2. Restructuring of the agricultural innovation system | 189 |
| 7.3. The complex links between digital technology and environmental issues | 193 |
| 7.3.1. The oppositions between digital technology and forms of ecological agriculture. | 193 |
| 7.3.2. Potential hybridizations to be built. | 198 |
| 7.4. Guiding innovation | 200 |

| | |
|-------------------------|-----|
| Conclusion | 203 |
| References | 209 |
| Index | 241 |