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Public-Private Partnerships in Agricultural Extension

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Agricultural extension has grown out of government agencies being the only source of guidance on productivity for farmers. Today, farmers demand comprehensive assistance on production technology, climate risk, input selection, mechanisation, financing, insurance, value addition, food safety, certification and access to remunerative markets. Public extension groups alone typically find it difficult to address these different objectives because of limited manpower, poor operating funds, weak market links and quickly changing technology circumstances. On the other hand, purely commercial consulting services might be aimed at lucrative commodities, commercially appealing places and farmers who have the ability to buy inputs or pay for service costs. Public-private partnerships therefore provide a viable institutional mechanism through which the public sector, commercial firms, research organisations, farmer associations and civil-society institutions may pool their complementary skills.

Partnerships, if effectively constructed, may bring together the public sector's mission for equality, regulation and public welfare with the private sector's technical skills, investment capacity, managerial efficiency and market understanding. Such cooperation might enable joint demonstrations, contract-based extension, input-linked consulting services, digital platforms, value chain development, innovation hubs, farmer producer groups and specialist fee-based services. But collaboration should not be identified with privatisation or a retreat of the state. Partnerships may generate conflicts of interest and uneven access without open governance, independent technical validation, farmer engagement, data protection and measures for inclusion of women, tenants and resource-poor farmers.

In this essay we discuss the idea, main models, possible advantages, constraints and governance needs for public-private partnerships in agricultural extension. It proposes that the best way is a pluralistic, demand-driven and accountable extension system where each institution plays the function for which it has the greatest potential. Public-good services still need public investment, but private involvement may lead to more specialisation, responsiveness, innovation and market orientation.

Introduction

Agricultural extension links scientific knowledge, public policy, markets and the practical experience of farmers. Extension was traditionally seen as a public good, with government staff communicating research suggestions to rural populations. The model had a key role in spreading the use of better varieties, fertiliser recommendations, plant-protection measures, irrigation methods and livestock-management technology. But the agricultural setting in which extension presently functions has grown much more complicated.

A farmer producing cereals, vegetables, fruits or flowers may concurrently need information on weather, soil health, insect monitoring, input quality, mechanisation, credit, insurance, grading, packing, certification and market pricing. Farmers also confront new obstacles such as climatic unpredictability, invasive pests, growing production costs, natural-

resource deterioration and tougher food-safety regulations. In these circumstances, good guidance involves a number of skills that are seldom found in one institution.

Public agricultural extension programs have often been hamstrung by a lack of field staff, transport, operational finance and professional assistance. Large geographic jurisdictions and high farmer-to-extension worker ratios may lead to less frequent, and worse quality, interaction with farmers. Extension projects may also be supply driven if the activities are motivated by departmental aims and not the real issues of farmers. Anderson and Feder termed this a contradiction between the positive intentions of extension and the institutional realities that sometimes limit its efficacy.

Public services may be supplemented by the resources of private corporations, agribusinesses, input suppliers, financial institutions, digital enterprises and commodities processors. They may bring specialist expertise, new communication technologies, market intelligence, logistics, investment and performance-oriented management. But there are limits to private supply. Where commercial suppliers have limited motivation to service rural places, subsistence crops or families with little buying power markets may not function well. Their recommendations may also be influenced by the things they are selling.

The essential policy concern is hence not whether expansion should be purely public or private. What is more beneficial is to ask how can the skills of many players be united in the protection of farmers' interests. Research on pluralistic advising systems suggests a "best-fit" strategy where finance, delivery methods and institutional duties are modified to local production systems, markets, communities and organisational capabilities rather than replicated from a single universal model.

Understanding Public–Private Partnership in Agricultural Extension

A public-private partnership in agricultural extension is a formal arrangement (partnership) for sharing resources, responsibilities, risks and projected benefits between public institutions and private groups in the delivery of information or associated services to farmers. The partners might include government departments, agricultural universities, research institutions, commercial corporations, banks, insurance firms, input manufacturers, processors, exporters, non-government organisations, cooperatives and farmer producer associations.

The cooperation is not the government buying things. It often demands constant cooperation, defined roles, common goals and procedures for evaluating performance. The public partner may provide scientific validation, policy coordination, infrastructure, some money, farmer mobilisation or regulatory control. The commercial partner might provide specialist staff, equipment, digital technologies, market links or operational management.

The economic character of an advising service will affect the decision on whether public or private finance is acceptable. Advice on epidemic pest monitoring, environmental protection, climate adaptation, safe pesticide usage and conservation of natural resources is beneficial not just for the individual farmer. Such functions of a public benefit usually need public funding and supervision. Some degree of private funding may be supported for advice directly related to commercial production, specialised equipment, contract procurement or premium-value commodities. Umali-Deininger's study suggested that public and private expansion should be seen as possible partners, with roles that depend on the sort of service, its recipients and the degree to which the benefits might be privately collected.

Therefore, public-private cooperation should not be mistaken with full privatisation. In privatisation the state may hand over responsibility for delivery and finance to private players. Under partnership, the state remains responsible for public welfare, regulation and fair access, while engaging other entities to enhance delivery. This is crucial since research on commercialised extension has indicated that small farms may be rendered invisible when advising systems rely mostly on the capacity of customers to pay.

Why Partnerships Are Becoming Necessary

Diversification of farmers' needs

The modern extension is anticipated to go beyond providing advice for crop productivity. Farmers require help to develop enterprises, handle post-harvest issues, process and sell products and manage risk. The horticulture producer may need help from agronomist, plant pathology, irrigation expert, lender, pack-house operator and retail buyer. Partnerships allow these services to be provided in the context of the agricultural business rather than via separate governmental initiatives.

Limited public resources

Public services are still necessary, particularly for vulnerable and isolated areas. However, funding and manpower restrictions typically limit regular interaction of public extension agents with all the farms. Coverage may be improved by collaboration with skilled input dealers, agribusinesses, producer associations and digital platforms. The goal should be to increase capacity in the public system, not only to save government spending.

Rapid technological change

Agricultural technology are getting increasingly sophisticated and data-intensive. Public agencies may not have in-house competence in remote sensing, sensors, automated machines, mobile apps and decision support systems. Private IT companies may provide technological platforms and universities and public research organisations can validate proposals. This combination may lessen the risk of spreading advice that is technologically spectacular but agronomically inappropriate.

Increasing importance of markets

The revenue of a farm relies not only on produce but also on quality, timing, aggregation, processing and access to market. Processors, merchants and exporters know the grades, safety requirements and delivery dates necessary. Their participation may help make extension more market responsive. But commercial needs must be weighed against farmers' negotiating leverage and production risk.

Development of agricultural innovation systems

Researchers seldom are innovative, and then just hand it off to farmers. It is created by the cooperation of scholars, consultants, firms, farmers, policy officials and financial institutions. Innovation intermediaries may bridge farmers' desire with scientific and commercial information that exists, make negotiations easier and assist build collaborative networks.

Research on agricultural partnerships suggests that they should be examined not just for immediate organisational or financial benefits, but also in relation to their contribution to larger innovation-system functions. These roles include information interchange, entrepreneurial experimentation, resource mobilisation, legitimacy, market development and advice for future innovations.

Major Models of Public–Private Extension Partnership

Contracted extension services

In this approach a state agency funds expansion but contracts out the provision of specific services to a private enterprise, university, consultancy, non-governmental organization or farmer group. The contract might be for farmer training, demonstrations, soil testing, digital advisory or speciality livestock and horticulture services. Contracting may provide flexibility and enable government to tap expertise without permanently growing its personnel. However, contracts should clearly specify intended beneficiaries, standards of performance, anticipated results and monitoring indicators. Payment based only on the number of meetings held may incentivise shallow implementation. Rather the performance should be judged in terms of relevance, farmer engagement, knowledge acquisition, adoption when appropriate and gains in problem solving skills.

Value-chain and market-linked extension

Processors, exporters, retailers and aggregators sometimes advise farmers from whom they buy food. Services might cover such things as varieties, production schedules, quality

standards, traceability, harvesting, grading and post harvest management. Such agreements are especially significant for vegetables, fruits, seed production, spices, medicinal plants, milk, poultry and export orientated goods. The attractiveness of this approach is that technical assistance comes with a potential market. Its downside is the lead business might pass production and pricing risks on to the farmers. Contracts should consequently include quality requirements, pricing methodologies, rejection criteria, payment durations, input expenses and dispute resolution mechanisms. Independent public or producer organization monitoring helps in situations of uneven negotiating power. Research on African agricultural value chains indicated that partnerships may assist to solve simultaneous market and governmental problems, but the data does not support the assumption that all partnerships automatically mobilise investment or benefit smallholders. “The results depend on the design of the incentives, governance and inclusion of farmers in the value chain.

Input-linked advisory services

Seed, fertiliser, pesticide, feed, veterinary-medicine and equipment companies often consult farmers. Because of their huge rural networks, they are essential sources of information. Selected dealers may be trained and certified as para-extension staff by governments and agricultural colleges. The agreement might involve refresher training, computerised diagnostic help and referral mechanisms for conditions requiring experts.

This approach can offer timely guidance at places where farmers go. The main problem is conflict of interest. A dealer that profits from product sales may propose goods that are superfluous or improper. So we need mandatory disclosure, authorised recommendations, prescription records, diagnostic processes and regular technological audits.

Research–industry–farmer partnerships

Seed corporations, technology firms, processors and farmer associations may work with public research institutes and universities to develop and test innovations. “Farmers should be involved in the prioritisation and field testing process, not just given the finished products. International agricultural research collaborations demonstrate that public and commercial organisations may pool scientific talent, proprietary technology and delivery networks. At the same time, collaborations will have to address issues like as intellectual-property rights, research risks, benefit sharing and the chance that commercial interests might override neglected crops or resource-poor areas.

Digital extension partnerships

“The digital expansion can also include mobile phones, interactive voice response, video, call centers, satellite information, weather data and artificial intelligence. Public bodies may supply verified material and databases, while private companies can provide software, communications infrastructure and analytics. Farmers may comprehend and use the advice with the support of local extension professionals, community-resource individuals or producer associations.

Digital channels lower the marginal cost of reaching huge audiences, yet knowledge alone does not ensure acceptance. Aker’s assessment pointed out that information and communication technology may lower information costs, but the effects are contingent on content, timeliness, farmers’ capacity to respond and integration with other services.

A significant analysis in Science came to a similar conclusion that digital advising services have tremendous promise but effective programs need rigorous experimentation, proper targeting and a realistic grasp of farmers’ limits.

A cluster-randomised trial in southern India found evidence that advice packages including videos, text messages and interactive voice communication increased farmers’ recollection, awareness and implementation of recommended cashew practices. The results show why digital technologies are often more successful when paired with trusted human facilitation rather than as a whole replacement for field extension.

Farmer-organisation-mediated partnerships

Cooperatives, self-help organisations, commodities associations and farmer-producer organisations may serve as representatives of farmers when negotiating with governmental

authorities and corporations. They may pool demand for advisory services, arrange demonstrations, buy inputs in bulk, sell goods in bigger quantities. This concept provides farmers with a collective voice and lowers the transaction costs of contacting many dispersed smallholders. Its performance relies on honest leadership, members' engagement, competent administration and distribution of advantages. Weak or elite-controlled institutions might exclude renters, women and impoverished producers.

Potential Benefits of Public–Private Partnerships

Wider reach and complementary expertise

Partnerships may increase geographical and technological coverage by sharing duties across entities. Private experts may work on equipment, processing, certification or market needs. Public extension workers may work on community mobilisation, inclusion and public good concerns.

Timely and specialised services

Private organisations generally make operational choices quickly and hire highly skilled people. Their cooperation may increase the timeliness of pest alarms, market information, equipment services and business specific advice. Farmer opinions in Burkina Faso reveal that the quality of public and private extension varies in terms of relevance, availability, timeliness, price and appropriateness of delivery. The findings support the comparison across a number of service qualities rather than one area being inherently better.

Market-oriented production

The partnerships might be the linking of extension with aggregation quality management processing and purchasers. Farmers learn not only how to produce more, but how to produce the kind, quality and quantity desired by a given market.

Innovation and resource mobilisation

Private investment may provide equipment, digital platforms, labs, demonstration inputs and specialist expertise. Public institutions provide scientific credibility, long-term research capability and policy legitimacy. Ferroni and Castle maintain that agricultural partnerships are beneficial if teamwork enables the partners to attain goals they could not achieve on their own.

Demand responsiveness

Advisory initiatives are more likely to address genuine production and market challenges when farmers, producer associations or value-chain players are involved in planning. The 'best-fit' paradigm indicates that expansion design has to take account of production systems, market access, community characteristics, regulatory circumstances and provider capabilities.

Learning through participation

Partnerships may help farmer field schools, co-innovation and demonstration groups. Assessments of farmer field schools in East Africa have revealed that experiential and group-based learning may lead to improvements in productivity, income and poverty-related outcomes, but results differ among nations and farmer groups.

Major Risks and Limitations

Exclusion of poor and remote farmers

Naturally, private suppliers prioritise revenue-generating customers and goods. Commercialisation could limit small farms' access to services they cannot pay for via fees or to buy huge amounts of supplies. Evidence from Europe has demonstrated that less public coordination might lower the visibility of small farms and limit possibilities to co-produce information that is useful locally.

Conflict of interest

Recommendations of an input supplier may be biased by sales aims. This might lead to excessive use of fertilisers, pesticides, veterinary medications or proprietary items. We need public technological standards and independent testing.

Fragmentation of advisory systems

A pluralistic system is not always a successful one, even if there are several suppliers. They may duplicate efforts in economically desirable locations and leave tough places neglected. Research on advisory pluralism in Europe shows that coordination is a key obstacle, with different kinds of organization having different goals, financing and delivery mechanisms.

Decline in knowledge sharing

Information may be owned by commercial companies. Advisors working for rival groups may have little motivation to communicate observations in the field or participate in shared pest-surveillance systems. Public institutions should have knowledge platforms that are shared and include information that has public good value.

Short-term project orientation

Many collaborations come from brief ventures. External financing might be removed and services discontinued. For sustainability a realistic finance mechanism, institutional ownership, and progressive inclusion into existing extension systems are necessary.

Unequal bargaining power

Small farmers may sign contracts without clear comprehension of costs and quality requirements, data-use terms, or output dangers. Farmer organisations and individual facilitators may help to balance this.

Data privacy and digital dependence

Digital extension platforms may gather data on farmers' identification, location, farm size, productivity, transactions and finances. Partnerships should include regulations around informed permission, purpose restriction, data security, sharing with other parties and farmers' rights to modify or remove information.

Measuring activity rather than impact

Counting communications, training sessions or enrolled farmers does not prove the advice was beneficial. A good assessment should look at reach, inclusivity, farmer satisfaction, knowledge, adoption, economic results, environmental consequences and institutional learning. System level assessment is particularly crucial since an enterprise may meet its own aims but the larger advisory system is still fractured.

Principles for Designing Effective Partnerships

Start with a well-diagnosed farmer issue: A partnership should be entered into to address a particular issue, not just because cooperation is the rage. Priorities should be identified by local groups and farmers.

Assign positions in relation to comparative advantage: "Regulation should be led by government, equality, public-good information and scientific scrutiny. Private partners should provide specific technology, funding, management and market networks. Universities, research institutions and farmer associations representing users should verify proposals.

Make clear agreements: The agreement should include goals, beneficiaries, finance, duties, intellectual-property arrangements, data ownership, service standards, monitoring techniques and dispute-resolution processes.

Technical independence of guard: Commercial advice should be divorced from product marketing. Recommendations must be based on scientifically established concepts, legal criteria and locally suitable thresholds.

Guarantee inclusion: Contracts should include participation objectives for women farmers, smallholders, tenants, young farmers, tribal groups and distant villages when suitable. Some services with social and environmental advantages may need public subsidies.

Develop farmer choice and feedback methods: Farmers need to know who is giving the advice and if that person has an economic interest. Complaint mechanisms, quarterly satisfaction surveys and community review sessions may help to increase accountability.

Invest in the ability of all partners: Public extension personnel need training in market analysis, relationship management and digital technologies. Private advisers need orientation in adult education, public policy, inclusivity and environmental protection. Farm leaders need to be skilled in governance and negotiating.

Use mixed communication: Digital messaging need to be accompanied with demonstrations, local-language films, helplines, field trips and peer learning. Farmers have varying reading levels, access to phones, connection, and comfort in utilising digital platforms.

Independently monitored results: Independent review eliminates the danger of partners merely reporting good outcomes. Indicators should include who was reached, whose needs were overlooked, whether advice was technically valid and if economic advantages were equitably dispersed.

Develop an exit or continuation plan: A pilot partnership should address how services will be funded after the first funding stops. Mechanisms may include public budgets, membership fees, commodity taxes, user fees, shared value-chain investment and cross-subsidisation. Institutional studies on partnerships in Uganda indicate the need for a complete diagnosis. The outcomes are not determined by the agreement itself, but by local customs and expectations, the adaption of technology and institutional ties that impact how a partnership works in practice.

Relevance for Agricultural Extension in India

India already has a diverse atmosphere of agricultural extension. State departments of agriculture, horticulture, animal husbandry and fisheries function along with Krishi Vigyan Kendras, agricultural universities, research institutes, cooperatives, input dealers, agribusiness firms, non-governmental organisations, self-help groups, farmer-producer organisations and digital platforms. The Agricultural Technology Management Agency approach intended to encourage decentralised and coordinated extension at district level. In addition, India's extension reforms have increasingly prioritised convergence, information technology, market-led extension and engagement by commercial and civil-society groups. Nonetheless, reviews of the Indian extension continue to point to unequal access, coordination problems, limited operational resources and the need to relate guidance more directly to the different information needs of farmers. Complete fee-based privatisation is not suitable in India because of the high number of small and marginal holdings. Public extension should continue to be responsible for food-security crops, natural-resource management, climate adaptation, zoonotic-disease awareness, proper pesticide use, and help to disadvantaged farming families. Private engagement may be directed to areas where it brings unique value, such as protected cultivation, precision farming, agricultural equipment, seed systems, processing, certification, logistics and market information. A commodities cluster might be the basis for a viable district-level collaboration. The technical package may be validated by the public extension agency and Krishi Vigyan Kendra and farmers may be identified. A farmer-producer group might aggregate production and represent the members. A private firm may give processing or market access, a bank could finance operating capital, an insurance provider could provide suitable risk products and a digital organization could send weather and management notifications. Together, performance would be measured against metrics of farmer income, inclusion, input utilisation, quality, payment predictability and environmental impacts. The most critical necessity is to avoid the collaboration from turning into a company-centric one. Farmers should be involved in governance, have the right to reject improper advice and be given access to transparent information regarding pricing, risks and commercial interests. Public extension credibility should be the basis of extension partnerships, not a vehicle for selling items.

Future Directions

The future of public-private extension collaborations will increasingly be driven by digital platforms, farmer databases, remote diagnostics, and artificial intelligence-supported decision tools. These advancements may enhance customisation and speed, but also raise the need for data governance, algorithmic transparency and independent validation. To tackle climate change we will need partnerships that link weather information, robust cultivars, water management, crop insurance and disaster response. Public organisations are required to

coordinate disaster preparation, while private enterprises may provide satellite services, forecasting tools, financial products and supply-chain logistics. Future collaborations should also go beyond the adoption of technology as their main purpose. Extension must allow farmers to assess options, deal with uncertainty, organise cooperatively, and negotiate with markets. Advisors should be more and more like facilitators and innovation brokers, rather than one-way transmitters of suggestions. In his study of trends in agricultural extension, Norton affirms that budgetary constraints, decentralisation, new technology and changing farm structures are moving towards systems that mix public and private finance and delivery. The problem is to maintain credibility, inclusivity and farmer learning, whereas taking use of these new institutional options.

Conclusion

Public-private partnerships may improve the specialisation, responsiveness, innovativeness and market-orientation of agricultural extension. They may link scientific research to technological businesses, financial institutions, processors, producer organisations and farmers. They may also expand the scope of advisory services via digital communication, skilled local intermediates and value chain networks. But cooperation is not a panacea for the flaws of public expansion. Poorly conceived schemes may exclude small farmers, encourage commercial items, divide expertise, jeopardise data privacy or shift unnecessary risk to producers. The effectiveness of a partnership is less a function of the number of companies involved, but more a function of the quality of governance connecting them. The correct goal is not to replace private extension with public extension but It aims at creating a coordinated pluralistic system where public, private and collective institutions have a complementary function. “Government needs to continue to invest in and protect services that provide public good and support vulnerable communities. Private organisations should provide their experience, technology, investment and market links under transparent norms. Farmer associations should have a real voice in determining goals, assessing services and negotiating terms. Demand-driven, scientifically-sound, inclusive and accountable partnerships may change the character of agricultural extension from a fragmented technology-delivery mechanism to a complete innovation and livelihood-support system.

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