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AGRICULTURE FORUM FOR TECHNICAL EDUCATION OF FARMING SOCIETY

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Extension Strategies for Sustainable Water Management

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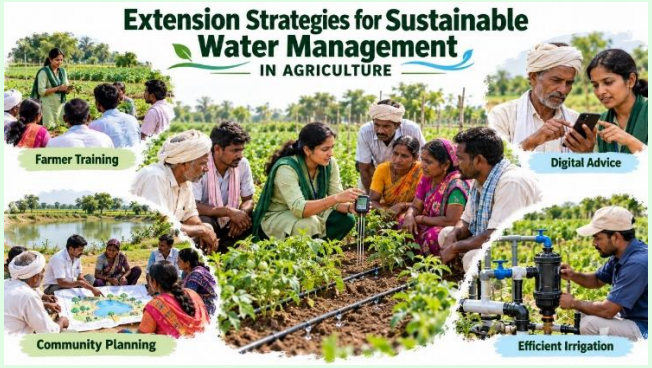
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INTRODUCTION

Water security begins with decisions made on farms, but its consequences extend across villages, aquifers and river basins. Sustainable water management in agriculture thus requires sustaining agricultural production without compromising the availability, quality and access to water for other users. Agricultural extension is the transmission of scientific knowledge to the practical decisions that farmers take on crops, irrigation and in managing common resources. It should go beyond mere promotion of equipment to enhancing observation, planning and sharing. A good programme enables farmers to know their water situation, try appropriate practices, and evaluate the outcome. The following approaches are based on research and institutional experience and offer options for action for extensionists, farmer organizations, and rural development agencies.



2. Begin with Participatory Water Assessment

Extension activities need to be initiated with a participatory survey of local water situation. Farmers and facilitators can plot wells, canals, ponds, drainage patterns and areas of seasonal scarcity. Irrigation costs, unreliable supplies, soil variations and access disputes should be recorded in the conversations. Measures of rainfall, groundwater levels and water quality can then be used to supplement farmers knowledge. It differentiates between problems resulting from insufficient supply and those resulting from ineffective delivery or mismanagement. Results should be delivered using simple village maps and seasonal calendars. FAO emphasises that credible water planning requires understanding supply, demand and their variation across locations and seasons throughout the year.

3. Strengthen Learning through Farmer Field Schools

Farmer field schools make water management into a routine of observing, experimentation and discussion. A couple of smaller meetings throughout a crop season can focus on such matters as soil moisture, root development, irrigation uniformity and crop response. Facilitators need to prompt participants to contrast practices, make sense of surprises and take recommendations to the farm. Sessions are more powerful when farmers take turns operating the equipment, reading the test results. FAO captures this hands-on method for building practical water management knowledge and local ownership. Extension services, then, should provide for sustained learning, with revisitations to the participants to assist in solving field problems when the initial training is over.

4. Demonstrate Practices with Measurable Results

Demonstrations need to measure benefits in terms that farmers can understand and believe. A randomized field experiment in Haryana in 2023 found that training farmers on alternate wetting and drying reduced pumping hours by 22% during peak pumping weeks with no yield impact. The result informs a useful instructional tool, but it does not mean the same

percentage reduction in water use everywhere. Extension demonstrations should directly contrast recommended and current practices, documenting crop performance, irrigation timings, flow rates and costs. Alternate wetting and drying in rice need appropriate field conditions and guidance on safe drying intervals. Locally verified results are a much more reliable foundation for adoption than promotional claims and unsupported promises.

5. Build Skills in Irrigation Scheduling

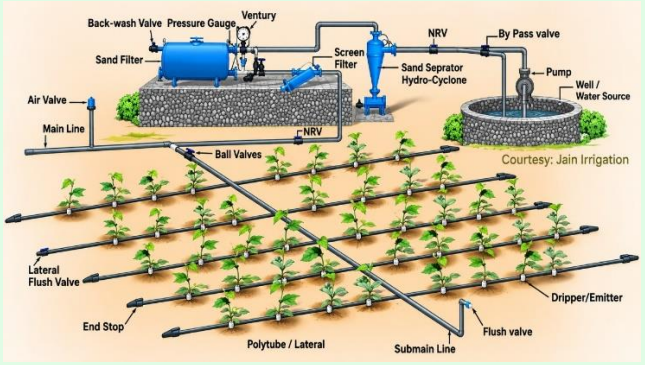
Irrigation advice needs to address three key questions: when to irrigate, how much to apply and when to stop. Extension workers can train farmers to integrate crop growth stage, soil moisture observations, recent rainfall and weather forecasts. If farmers can afford it, calibrated sensors or tensiometers can reinforce these choices, but the readings must be interpreted in the context of the specific soil and crop. Training should cover sensor placement, maintenance and calibration with field conditions. Recommendations must also consider limitations on water delivery, as farmers cannot always irrigate on demand. A straightforward irrigation diary can help households to spot unnecessary applications and to improve their decision-making process over time.

6. Make Digital Advice Accessible and Actionable

Digital advisory services work best when they offer clear, practical guidance at the right time. Farmers might receive brief audio notes, videos in local languages, radio updates or messages through community mobile groups. These can share reminders about watering, changes in rainfall and equipment upkeep. Advice should be tailored to the crop and area, and explain what action to take not rely on one-size-fits-all watering plans. Farmers should also be able to ask questions and say whether a recommendation fits what they see in their fields. For people with limited phone access or unreliable internet, in-person gatherings, printed guides and support from trusted local advisers remain important. Before sharing guidance widely, providers should check it with people who understand local conditions and ensure farmers can get follow-up support.

7. Promote Responsible Adoption of Micro-irrigation

Installing drip or sprinkler systems is only one part of successful adoption. Farmers also need hands-on guidance on maintaining filters, managing pressure, checking emitters, flushing lines and carrying out repairs, as well as a clear picture of ongoing costs. The right system depends on factors such as crop layout, water quality, land slope and access to maintenance support. A 2024 study in four Indian states explored whether micro-irrigation might lead farmers to make changes that increase overall water demand a potential rebound effect. For this reason, extension services should track total water use, not just how efficiently water is applied. Better equipment supports conservation only when farmers use it and make related cropping choices with local water supplies in mind.



8. Connect Water Advice with Crop and Soil Management

The advice on water should be provided in the context of crop and soil management and not as a stand-alone irrigation package. Extension demonstrations can evaluate the effect of the amount of surface residues, type of mulch, better field orientation and the timing of weed control on soil moisture. Discussions of crop planning should relate the seasonal water needs to the potential supply, market potential, and the consumption patterns of the household. Diversification has to be evaluated in economic terms, because even if a crop may need less irrigation, it may not be viable if there are no buyers or processing plants. Farmers should be offered locally adapted alternatives, including trade-offs and labour implications. This approach allows conservation to be incorporated into an attainable production system rather than an create of additional obligation.

9. Facilitate Community Water Planning

Agreements for groundwater and canal water management are necessary and cannot be achieved if individual farmers hold onto their interests. Extension agents can play a role in helping water user groups negotiate issues, such as irrigation turns, maintenance of the canal, and priorities in the event of water shortages. Community water budgets should link expected availability to planned demand, and be adapted as conditions alter. Institutional manifestation: India's Atal Bhujal Yojana: a government report by July 2025 recorded community water budgets, water security plans and public groundwater information in participating gram panchayats. The activities described above in these reports indicate participatory processes, although program reporting by itself is insufficient to

determine the causes of groundwater fluctuations. Open decisions contribute to the credibility of collective commitments.

10. Ensure Meaningful Participation

Inclusive extension has to accept that access to land, credit, information and power to make decisions is inequitable. Women farmers, tenant farmers, smallholder farmers and farmers at the tail ends of canals should be involved in setting priorities for training and discussions on water allocation. Meetings should take place at convenient times, and practical sessions should be organized to enable all participants to have access to tools and to ask questions. Young people can participate in measurements and in servicing equipment, where they are trained and have realistic job opportunities. Demonstration hosts should be diverse and inclusive of various farm situations, not just well-off farm families. Extension agencies need to evaluate whose concerns are shaping decision-making, because attendance numbers can tell you nothing about whether participation has become meaningful or equitable.

11. Link Farmers with Finance and Reliable Services

Financial and technical assistance should enable farmers to maintain the gains once the project is over. Extension workers may also help households to weigh up costs of investments, maintenance requirements, anticipated returns, and the dependability of vendors. Shared equipment or service contracts may increase access where purchase by an individual is out of reach, if responsibility and fees are clearly defined. Linkages between Krishi Vigyan Kendras, agricultural universities, irrigation department, farmer groups and local mechanics can facilitate diagnosis and spares. Commercial interests should be disclosed by advisory personnel, and they should not present a subsidy as the fact being suitable. Good aftercare, realistic budgeting and easy troubleshooting should be elemental to every technology promotion strategy, right from the beginning.



12. Measure Outcomes and Sustain Progress

An extension programme should be considered successful when it delivers lasting gains in water use, farm results and equitable access. Where possible, track how much water is applied, along with harvests, farm income after expenses, upkeep costs and who benefits. Pump operating time is not enough on its own: flow rates differ, and rainfall or nearby pumping can also affect groundwater levels. Farmers and facilitators should discuss the results together and decide what to change before the next growing season. Funding should depend on confirmed progress, not simply on the number of meetings held or tools installed. In the long run, the aim is to help communities make sound water-management choices and sustain those skills without outside assistance.

CONCLUSION

Effective water management in agriculture is based on a holistic approach that encompasses scientific understanding and farmer participation, and includes well-functioning irrigation systems and good management of water resources by users. In this context, agricultural extension is vital for disseminating water conserving technologies and management practices as solutions to local conditions. Participatory water monitoring, farmer field schools, pragmatic demonstrations, digital advisory services and village water systems planning can enhance farmers' ability to make decisions. Yet successful uptake relies on economic viability, technical assistance, access without discrimination and on-going monitoring. Soil and crop management integrated with prudent water use can enhance agricultural production and water use efficiency. Ultimately, appropriate extension approaches should enable rural farming communities to be water secure in the long term and to have environmentally sustainable and equitably resilient agricultural livelihoods.