ENHANCING IRRIGATION AGENCY AND WATER USERS PARTNERSHIP FOR THE REALIZATION OF A MODERN IRRIGATION SERVICE IN THE PHILIPPINES

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ABSTRACT

Irrigation development in the Philippines is a primary mandate of the National Irrigation Administration (NIA). Participatory approaches to irrigation system management and improvements have been adopted by the NIA with farmers since the 1980s. Almost all national irrigation systems (NIS) are under joint management contracts between NIA and the respective irrigators associations (IA). Efforts to improve performance of NIS include implementation of various improvement projects on systems' physical structures and their operation and maintenance, as well as regular programs on organization strengthening and capacity building for members of IAs. These efforts left quite something to be desired as there is in several NIS still a gap between irrigation service area and the actual irrigated areas, vandalism of structures, unauthorized diversions, conflicts over water distribution, and non-adoption of field-demonstrated water-saving techniques.

To help gain understanding on causes of and identify solutions to the gap and social disharmony, sets of data on desired system features and visions of modern irrigation service, which were gathered through consultation-workshops of IA representatives of sample NIS and interviews with concerned personnel of the NIA, were analysed and compared for level of consistency and agreements.

The results of the analysis showed inconsistency of some preferred system features and the aspired quality of irrigation service both within the individual personnel and irrigation agency. Also, there were differences in the visions of and selected options for irrigation system modernization between the concerned NIA and IA representatives. The findings revealed a need to enhance appreciation of the required coherence among the desired irrigation service, system operations and flow control structures so that consensus on logical and unified methods of realizing a common vision of quality irrigation service may be reached. Also the findings are instructive of the nature and focus of capacity development programs that would foster productive NIA and IA partnerships and enhance participation of water users in irrigation system modernization, operation and maintenance.

Keywords: national irrigation system; modernisation; participatory approach; capacity development; Philippines.

1. INTRODUCTION

The tradition of local farmers developing and managing their own small irrigation systems in the Philippines dates back to the pre-colonial period. David (2003) noted that one interesting feature of these systems was their built-in stability resulting from integration of cropping patterns, socio-cultural farming traditions and soil and water conservation and management practices in their design, operation, maintenance and management. In mid-1970s, the Government through the National Irrigation

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Administration (NIA) started adapting community management principles in government-assisted communal irrigation systems (CIS). Then in mid-1980s it began involving farmers in the management of operation and maintenance of publicly funded, government-owned national irrigation systems (NIS), which are mostly gravity-type, canal irrigation systems serving rice monoculture.

The NIA has been mandated to transfer the management of the operation and maintenance of NIS to farmers. It implemented an irrigation management transfer (IMT) program aimed at organizing and developing local farmers into self-reliant irrigators associations (IAs) that are willing and capable of operating and maintaining their respective NIS wholly or parts of it (NIA, 2017). To realize this objective, its Institutional Development Division (IDD) conducts different training and capacity building programs for groups of farmers and assists them to form their respective IAs. These programs include basic leadership development, values formation, financial management, system management and livelihood and entrepreneurships, among others.

As of December 2016, there were 285 NIS irrigating a total aggregate service area of 836,000 ha. About 78% of the total NIS service areas and about 88% of registered IAs or 2,600 IAs are covered by IMT contracts (NIA, 2016). About 3,000 IAs cultivating 90% of NIS service areas were provided with assistance by the NIA to help strengthen and sustained their respective associations. Capacity building in terms of training, seminars, workshops and consultation meetings were carried out in 7,460 batches and participated by about 133,500 farmers from 2,740 IAs.

The expected benefits from the implementation of IMT in NIS included increase in cost recovery by the government, improvement in system viability and self-sustainability and promotion of farmers' participation in or sole management of NIS. Also, the implementation of IMT was viewed as a way of incorporating institutional components, the apparent lack of which in earlier irrigation projects was deemed by many social science professionals to be the main reason for the mediocre performance of NIS rather than the engineering aspects.

Also, the NIA carried out a considerable magnitude of rehabilitation and improvement projects concerning the physical structures of many NIS in a bid to improve their performances and to encourage IAs to take over the system operation, maintenance and management (Delos Reyes *et al*., 2015). The responses of the farmers to system rehabilitation and improvement initiatives ranged from full appreciation to non-acceptance. Non-acceptance by, or disagreements of farmers over introduced improvements were manifested in the form of interference in the official water distribution, vandalisms or unauthorized modifications of irrigation structures and non-adoption of introduced irrigation techniques (Yabes, 1990; Horst, 1998; Delos Reyes, 2017).

There was apparent disconnection between what the farmers wanted and what the NIA planners and design engineers built for them. Harmony of aspirations for an irrigation system and ways to achieve them will enhance the NIA and IA partnership for irrigation management and mutual benefit for the Government and farmers. This study examined the NIA's and IA' visions and preferences for system operation and flow control structures of the two case study NIS. Its objectives included the following: analysis of the preferred physical structures, system operation, water distribution rules and institutional arrangements vis-a-vis their envisioned quality of irrigation service; determination of the consistency of the desired irrigation technology and techniques; and generation of relevant data input for formulating appropriate irrigation modernisation plans.

2. METHODS

2.1 Case Study: Balanac River Irrigation System (RIS) And Sta. Maria RIS

The two case study systems Balanac River Irrigation System (RIS) and Sta. Maria RIS formed part of a more comprehensive study on irrigation system modernisation by the authors (Delos Reyes, 2017). They are both gravity-type, run-of-the-river canal irrigation systems built and first operated in the 1960s, serving about 1,000 ha of rice areas each. Balanac RIS has open and ungated offtakes, duckbill and long crested weirs and a 30 km canal network, 90% of which is concrete lined. Sta. Maria RIS has constant head orifice (CHO), gated offtakes, cross regulators with spindle-type vertical gates and has 80% of its 30 km canal network concreted lined.

Both case study systems are aimed for productive irrigation during the dry season based on equitable water supply per hectare (Delos Reyes *et al.*, 2017). The apparent operational objective of Balanac RIS is imposed allocation to tertiary units by splitted flow and with splitted flow through the major conveyance canals. Interestingly, it employs a mix of upstream and proportional control. Meanwhile, the operational objective of Sta. Maria RIS is imposed allocation to tertiary units by intermittent flow and with rotational flow through the major conveyance canals. It employs upstream control.

2.2 Consultation-Workshops With IAS

One-day consultation-workshops on the formulation of visions of modern irrigation systems were carried out for each of the case study systems to obtain information on the farmers' views, opinions and preferences for their irrigation systems. The participants consisted of 21 of the 28 and 24 of the 26 turnout service area (TSA) presidents of Balanac RIS and Sta. Maria RIS, respectively.

Two sets of presentations were conducted during each consultation. The first was a presentation on what is a modern irrigation service, what is a vision for an irrigation system, the importance of such vision, useful mindset and attitude for and mutual benefits of formulating a vision from the farmers' perspective, NIA's vision for 2020 and a photo display of modern features of some irrigation systems. The second was a discussion on the different options for the physical structures of irrigation systems, water distribution rules and techniques, IA organization and functions and coping strategies for water supply variability, among other things. During this discussion, each participant was given a questionnaire, which was designed to solicit their views and opinions on the crucial system modernization, desired kind of flow control structures and system operations and management as well as their aspirations for the future state of their irrigation system and IA organization for the next 5-10 years. Explanations and contexts for each questionnaire item were provided with the aid of PowerPoint presentation slides. Clarifications, sharing of impressions, ideas and grievances concerning particular items on the questionnaire were also accommodated and discussed. The participants were then asked to individually fill out the questionnaire.

2.3 Interview With NIA

The interviews with the NIA were held in separate occasions and used a similar questionnaire developed for the purpose of gathering NIA visions of the modern irrigation service as well their preferred irrigation technology, system operation and management and climate-adaptation strategy. The eight interviewees were key

design and operations engineers of the NIA regional, provincial and system offices, which have jurisdiction of the case study systems.

2.4 Consensus and Consistency of Selected Modernization Options

The level of consensus for the different options was determined by the frequency or total number of times the particular options were selected by the participants. The consistency of the desired irrigation technologies and techniques was analysed based on the logic design framework (Figure 1), which was extended to include the water supply aspect or headwork of the irrigation systems (Delos Reyes *et al.*, 2017). Selected options that were incoherent with each other based on the extended logic design framework were counted as conflicting selections.

3. RESULTS AND DISCUSSION

3.1 IA Vision for Balanac RIS: Consensus and Potentials

Most of the improvement options hoped by at least two-thirds of the participants were mainly related to IA organization, functions and management (Figure 2). This suggests that there was a high level of awareness on the importance of IA organisation and involvement in irrigation system planning and management. Also, typical irrigation system goals such as adequate water and equitable and good irrigation service for at least two cropping seasons were envisioned by this significant majority. Some of the most-preferred options were interesting since they are either opposites of the present practices or not presently practiced in Balanac RIS. They included rotational irrigation, implementation of a cropping calendar and climate-proactive scheduling of farming activities. Balanac RIS was designed for and practices continuous water delivery as well as laissez faire cropping schedules. This would indicate the participants' receptiveness to directed system-wide planning of a cropping calendar and irrigation schedules in order to adapt to the changing climate and water supply situation.

Meanwhile, the system features related to physical structures desired by the significant majority were limited to canals and legal protection of dams against quarrying. The relative lower frequency of selection of most modernisation options related to the physical components of the irrigation system, i.e., only between half and two-thirds of the participants, would suggest neutrality or indecisiveness of a significant number of the participants on the kind of physical structures with which their desired irrigation service can be achieved. Nevertheless, the participants' selection of the kind of physical structures would show their desire for their future system to have the capacity to reliably meet irrigation targets and demands and means to augment and manage their water supply.

Other remarkable selections by about half of the participants were flow measurements, flow control structures with adjustable gates and a reservoir-type dam. The first two were in contrast to the design of Balanac RIS which employs fixed gates and long and proportional weirs for flow control and distribution. The reservoir-type dam reflected the participants' vision of storing water for a more secure and reliable irrigation supply.

In general, the set of selected modernisation options by the participants reflected their desire for alternative irrigation structures and water distribution method that they deemed would be more useful in achieving their envisioned quality of irrigation service. While there was a general agreement on a reasonably promising water distribution philosophy and techniques, there was no strong consensus on the kind of specific flow control structures to accomplish such distribution goals and methods.

Parameters	Choices for design philosophy/system objectives				
Irrigation target	Protective			Productive	
Cropping system	Rice mono cropping			Diversified cropping	
Design irrigation season	Wet season			Dry season	
Irrigation during other season	Dry season: all area - fallow small area - protective	Dry season: all area - protective small area - productive		Wet season: Supplementary	
Irrigation supply in the system	Equitable supply to farmers	Equitable supply to hectares		Flexible supply based on water need and availability	Flexible supply based on water demand
	Choices for operational objectives of main system				
Decision-making on water allocation to tertiary unit (TA)	Imposed allocation			Semi-demand allocation	On-demand Allocation
Method of water allocation to TA	Splitted flow	Intermittent flow	Adjustable flow	Adjustable flow or intermittent flow	Adjustable or intermittent flow
Method of water distribution through the main system	Splitted flow	Rotational flow	Adjustable flow	Adjustable Flow	Adjustable flow
Flow control method	Proportional control	Upstream control or simultaneous control		Upstream control or predictive control	Downstream control or volume control

Logical design choices for: protective irrigation (gray); productive irrigation (green); possible for both (blue). Logical design combinations of parameters of operational objectives are grouped in stacks.

Figure 1. Logic choices for overall system objectives, parameters of operational objectives and flow control methods (adopted from Ankum, 2001)

3.2 IA Vision for Sta. Maria RIS

The modernisation features selected by at least two-thirds of the participants of Sta. Maria RIS represented an apparently logical mix of improvement choices. In general, their desired physical structures and flow distribution techniques would address their limited water supply and help realize their vision of equitable and orderly distribution of water. The topmost wishes of the participants were related to functions and nature of their organization (Figure 3). Admiringly, an IMT Model 4 which means a complete turnover of system management to the IA was envisioned by at least two-thirds of the respondents. The most hoped-for features related to overall system goal included a secured and legally protected water right of the system and priority right of farms in the original service area. In terms of the physical structures, the most desired modernisation options included a storage-type dam, well-maintained dam approach and gates and water supply augmentation such as spring water development and drainage water reuse.

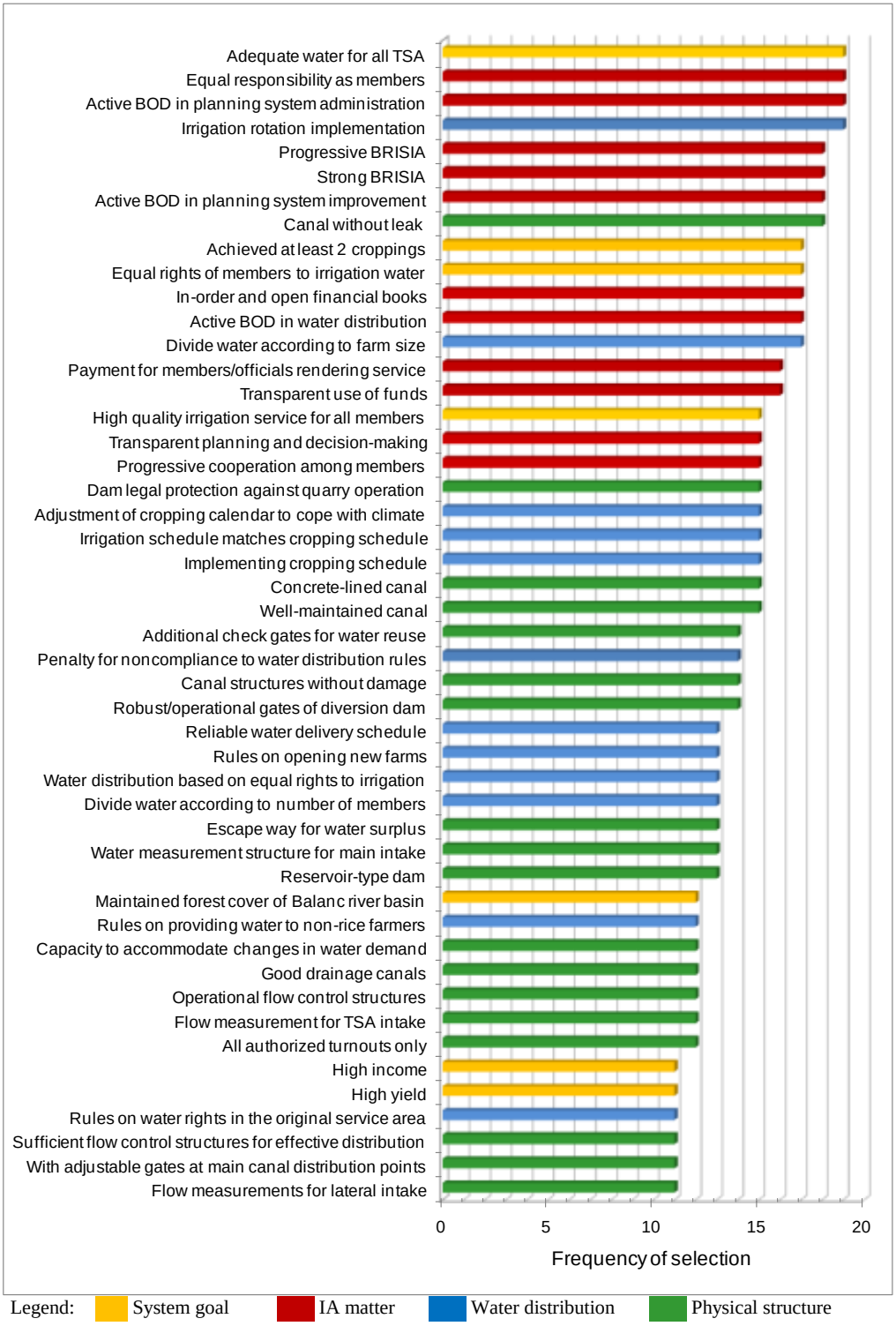


Figure 2. Features of a modern Balanac RIS as envisioned by at least half of the participants.

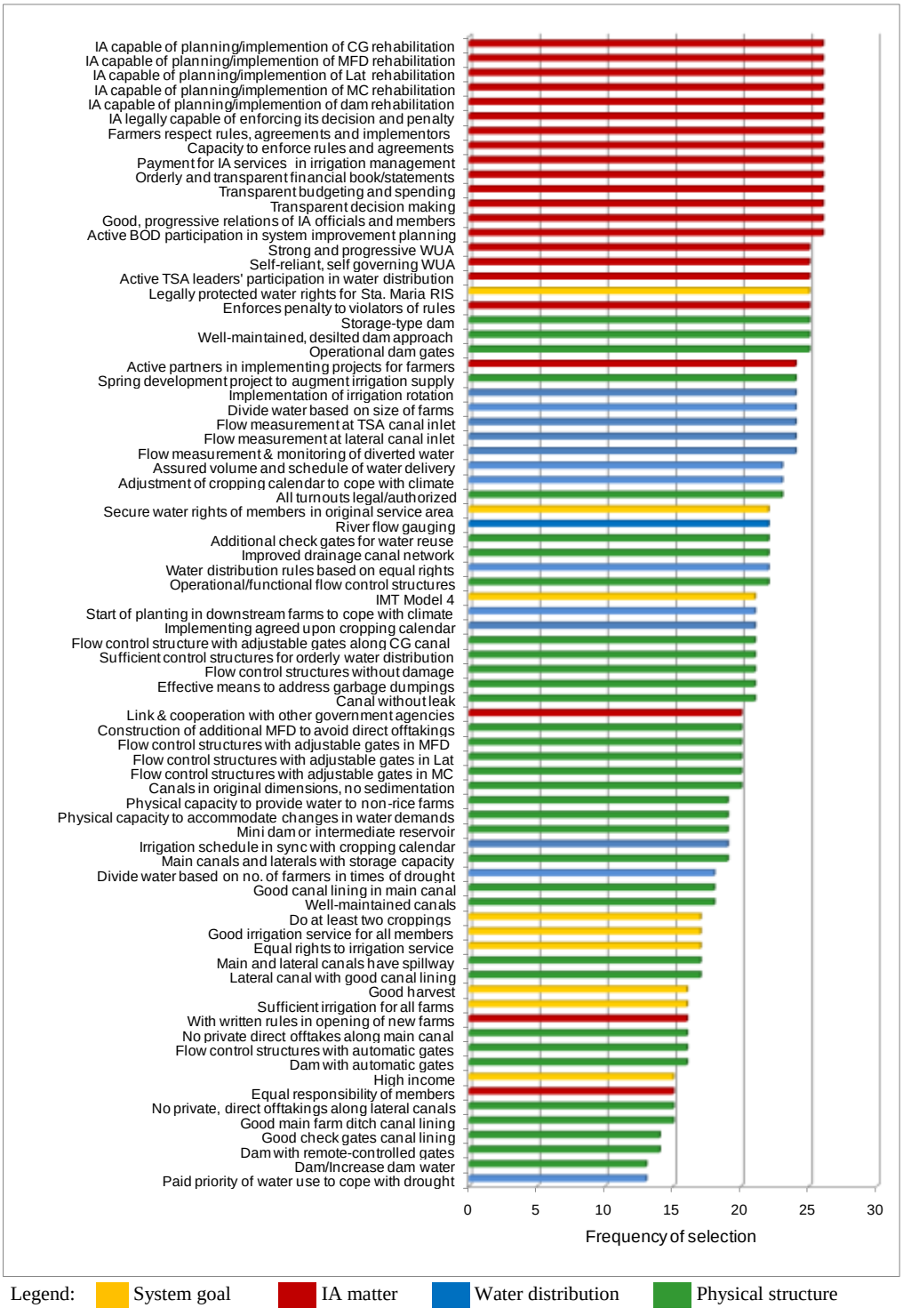


Figure 3. Features of a modern Sta. Maria RIS as envisioned by at least half of the participants.

This almost unanimous focus on dam and water supply augmentation reflected a strong desire to address the most fundamental issue in Sta. Maria RIS, i.e., their inherently limited water supply (Delos Reyes *et al*., 2015; 2017). Meanwhile, the most

selected features with regards to flow distribution included irrigation rotation, water division based on farm size and equal rights, canal flow measurements, reliable water delivery, climate-based adjustments of cropping calendar and river gauging.

3.3 NIA Vision

All NIA respondents wished for their NIS to be a model system for irrigation modernization (Figure 4). The unanimously selected modernization options included dam and river preservation, intermediate reservoirs, irrigation rotation, early start and segmental planting, flow control structures with adjustable gates along irrigation canals, concrete-lined main and lateral canals and trash filter in lateral, sub-lateral and water reuse canals. Except for dam approach protection, trash filter, open turnouts and undershot flow control structures with adjustable gates in water reuse canals, all physical structures and flow distribution modernization options selected by at least two-thirds of the respondents were not found or practiced in Balanac RIS. In contrast, majority of selected modernization options were present or practiced in Sta. Maria RIS except the relatively innovative technology like intermediate reservoir, telemetry, physical capacity to accommodate variable and precise irrigation demands, and canal spillway and storage capacity. This reflected different degrees of discrepancies between the present state and the NIA engineers' visions of the case study systems.

3.4 Consistency of Preferred Options

Some modernization options, which would be mutually exclusive, were both selected by a significant percentage of the participants (Figure 5). These included direct offtaking, ungated or fixed gated flow control structures and presence of turnouts with adjustable gates alongside with those open or ungated, which are incompatible with their desired rotational irrigation. Choosing mutually exclusive options would represent inconsistency by individual participants in their respective selection. Conflicting selections would indicate an inadequate understanding of the interdependency of canal flows, flow structures operation and water distribution. Meanwhile, a significant number of participants did not select any options for gates and direct offtakes. This would mean indecisiveness or doubt concerning possible implications of choosing particular options. Also, similar conflicting options were both selected by the NIA respondents (Figure 6). While almost all of them chose turnouts with adjustable gates, majority of them also agreed to presence of open or ungated turnouts, which are inconsistent with rotational irrigation.

3.5 NIA-IA Partnership Enhancement

The results of the consultation-workshops showed the following about the IA members: i) they are well aware of the essential functions and characteristics of farmer-irrigators organization that would be beneficial to them; ii) they subscribe to typical irrigation system goals of providing equitable and quality irrigation service to support increased crop production; iii) they are amenable to a number of system management and water distribution strategies aimed at coping or adapting to adverse impacts of climate change; and iv) they are unacquainted with the logical combinations of water distribution objectives and flow control structures. These findings suggest that educational or training programs on the aspect of flow control structures and their implications on water distribution and system operations would have the most potential in enhancing the capacity of the IA of Balanac RIS and Sta. Maria RIS to participate in planning for system modernisation and management. Such training programs would promote clear understanding of the purposes, mechanisms,

operational requirements and hydraulic behaviours of the different options for flow control structures, including canal flow dynamics.

Figure 4. Features of a modern NIS as envisioned by two-thirds of the NIA respondents.

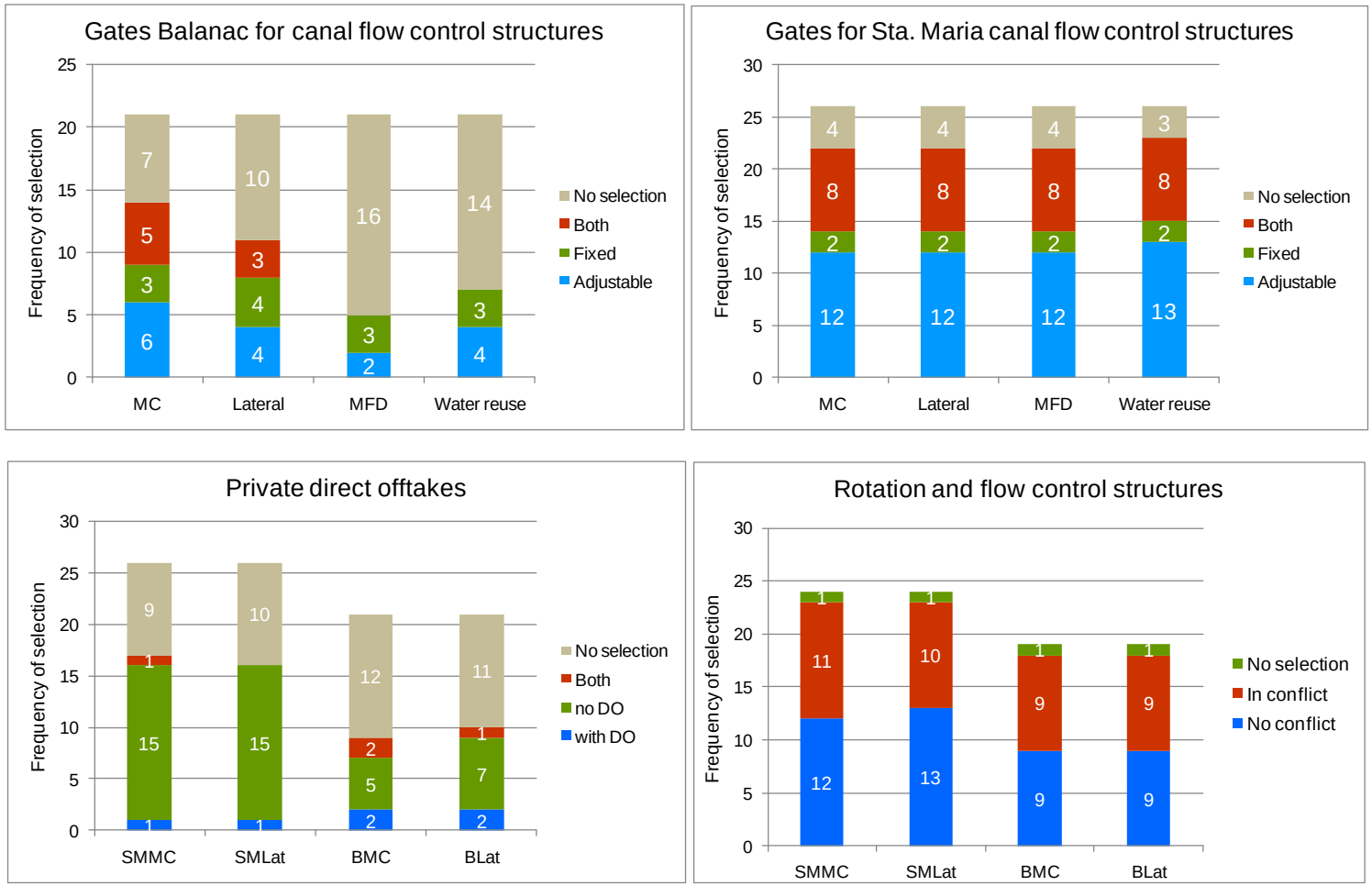
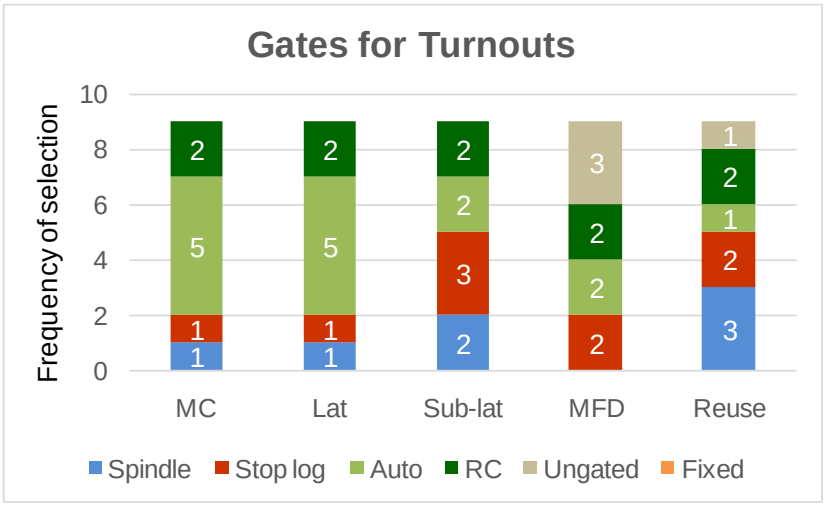


Figure 5. Consensus and consistency of selection regarding gates and direct offtakes for modern NIS

Similarly, NIA design and operations engineers would benefit with such kind of training. The scope, nature and method of the consultation-workshops described in this case study present a framework for an IA education program that would help realize a mutually beneficial participatory approach in planning system modernisation. These, including the questionnaires and presentation materials would serve as a general guideline or eventually a training manual when they are developed further.



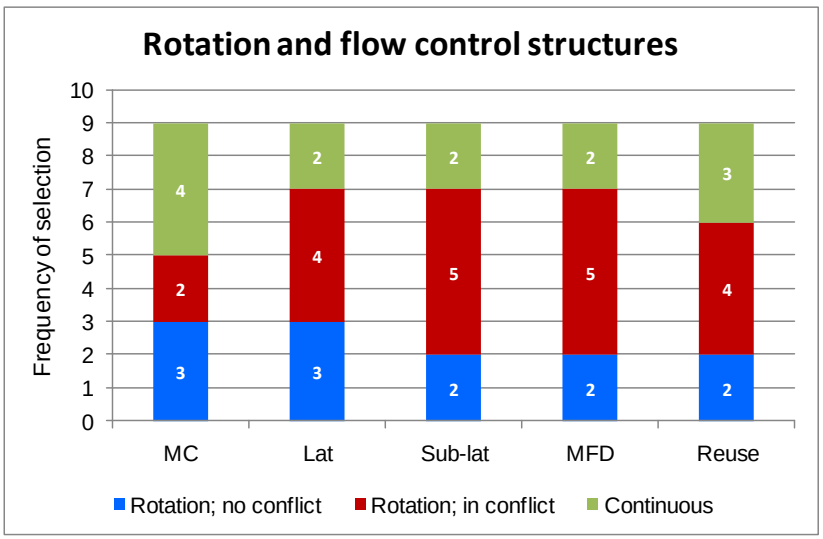


Figure 6. Consensus and consistency of selection by NIA.

4. CONCLUSIONS

The IA participants and the NIA respondents have parallel general visions - water-secured, climate proactive irrigation systems providing quality, equitable service. They both have ideal aspirations for their functions as organizations - a strong progressive IA capable of irrigation system management and a model NIS for system modernization. However, the conflicting individual preferences, indecisiveness and inconsistency in the selection of irrigation technology and techniques in both groups would not support well the realization of their visions of their future modern irrigation systems. The findings would implied insufficient appreciation of the logical relations

among different types of flow control structures, water distribution methods and water delivery targets. The logical coherence among the system goals, system operation objectives and flow control method at the system level in the design of modernization plan would need to be emphasized. A capacity enhancement and training programs on these aspects would be useful in attaining the objectives of IMT and realizing the visions of IA and NIA for their systems.

The nature of consultation-workshop and interview used in this study presents a method of operationalizing participatory approach in planning for irrigation system modernization. It would be useful in identifying possible sources of conflicts or disagreement between NIA engineers and IA as well as among farmers. Thus, it would be instructive of the scope of capacity enhancement and training programs to avoid such conflict and promote productive IA and NIA engagement for irrigation system modernization.

5. REFERENCES

Ankum P. 2001. *Flow control in irrigation systems*. Lecture notes LN0086/04/01. UNESCO-IHE, Delft, the Netherlands. 344 pages.

David WP. 2003. *Averting the Water Crises in Agriculture: Policy and Program Framework for Irrigation Development in the Philippines*. University of the Philippines Press, Diliman, Quezon City, Philippines.

Delos Reyes MF, Schultz B, Prasad K. 2017. Diagnostic assessment approach for formulating a modernization strategy for small-scale national irrigation systems in the Philippines. *Irrigation and Drainage,* **66**: 542-555.

Delos Reyes MF. 2017. Modernisation strategy for National Irrigation Systems in the Philippines. Balanac and Sta. Maria River Irrigation Systems. PhD Thesis UNESCO-HE. Delft, the Netherlands.

Horst L. 1998. *The dilemmas of water division: considerations and criteria for irrigation systems design*. International Irrigation Management Institute. Colombo, Sri Lanka.

National Irrigation Administration. 1980 to 2014. *Annual Report.* Quezon City, Philippines.

National Irrigation Administration. 2017. *Irrigation management transfer*. Downloaded: http://www.nia.gov.ph/?q=content/institutional-development-program.

Yabes RA. 1989. *Indigenous proportional weirs and modern agency turnouts: design alternatives in the Philippines.* International workshop on design issues in farmer managed irrigation systems. International Irrigation Management Institute. Colombo, Sri Lanka